

NOAA Data Report ERL PMEL-20



FISHERIES-OCEANOGRAPHY COORDINATED INVESTIGATIONS (FOCI)
FIELD OPERATIONS—1986

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Pacific Marine Environmental Laboratory
Seattle, Washington
July 1987

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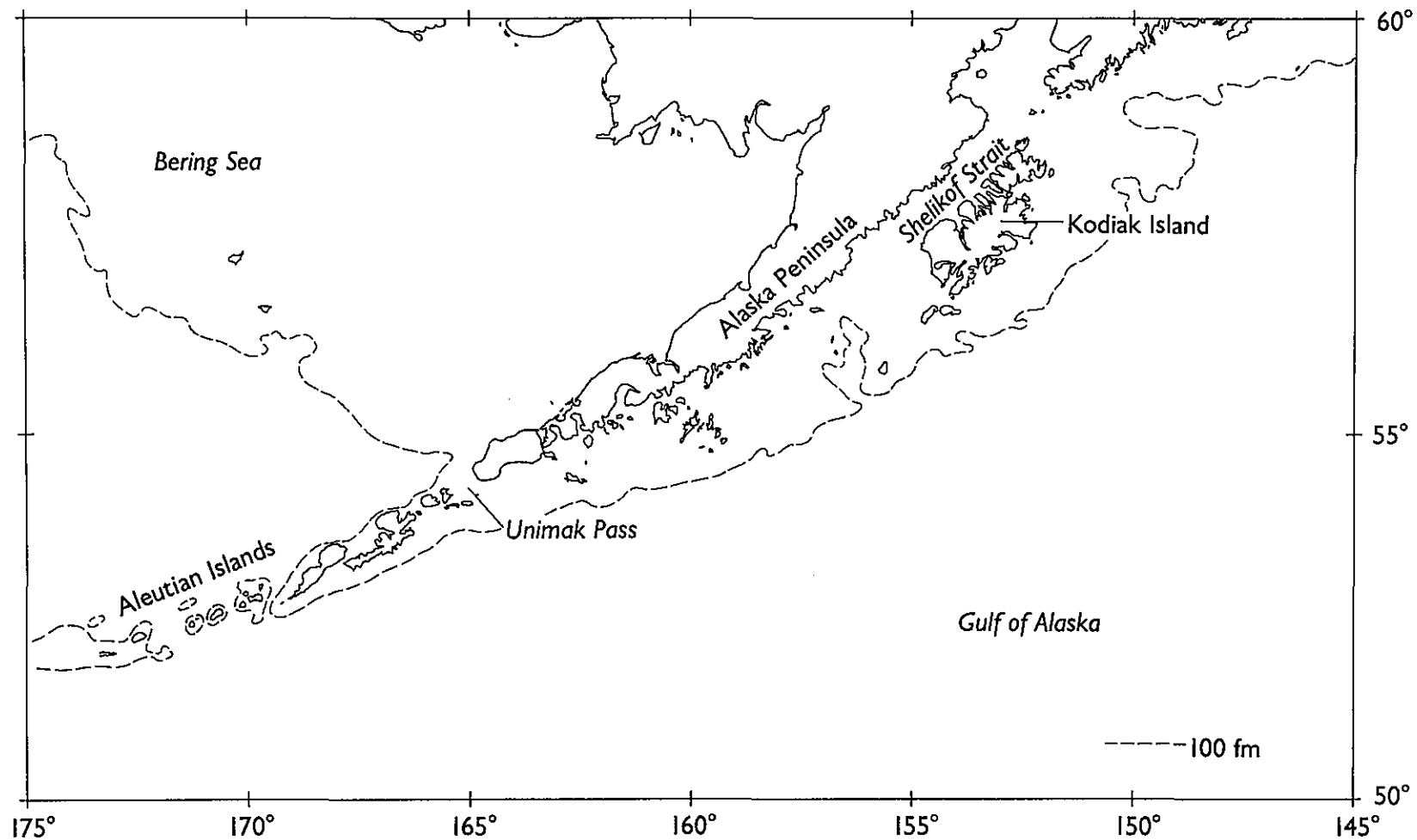
NATIONAL OCEANIC AND
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Environmental Research
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Frontispiece. Geographical region of FOCI research.

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LIST OF ABBREVIATIONS

AOML	Atlantic Oceanographic and Meteorological Laboratory, Miami, FL (NOAA/OAR/ERL)
ARGOS	a French satellite communications network
BNL	Brookhaven National Laboratory, Upton, NY
ERL	Environmental Research Laboratories (NOAA/OAR)
FAO	United Nations Fisheries and Agricultural Organization
FOCI	Fisheries-Oceanography Coordinated Investigations
FOX	Fishery Oceanography eXperiment (a FOCI program)
FY	Fiscal Year
GMT	Greenwich Mean Time
GOES	Geostationary Operational Environmental Satellite
JD	Julian Day
METNET	METeorological NETwork of remote surface stations
NESDIS	National Environmental Satellite Data and Information Service
NMFS	National Marine Fisheries Service (NOAA)
NOAA	National Oceanic and Atmospheric Administration (U.S. Department of Commerce)
NWAFc	NorthWest and Alaska Fisheries Center, Seattle, WA (NOAA/NMFS)
OAR	(Office of) Oceanic and Atmospheric Research (NOAA)
OCSEAP	Outer Continental Shelf Environmental Assessment Program (an inter- agency program with NOAA and the Minerals Management Service)
PMEL	Pacific Marine Environmental Laboratory, Seattle, WA (NOAA/OAR/ERL)
RIBS	Recruitment Investigations in the Bering Sea (a FOCI program)
RSMAS/ U.Miami	Rosensteil School of Marine and Atmospheric Sciences/University of Miami, FL
SDSD	Satellite Data Services Division, Suitland, MD (NOAA/NESDIS)
UW	University of Washington, Seattle, WA

FISHERIES-OCEANOGRAPHY COORDINATED INVESTIGATIONS
FIELD OPERATIONS—1986

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1. INTRODUCTION

The research outlined in this report was conducted as part of the Fisheries-Oceanography Coordinated Investigations (FOCI), a program conducted jointly by the Pacific Marine Environmental Laboratory (PMEL) and the Northwest and Alaska Fisheries Center (NWAFC). This program was formally initiated in 1986 to enable simultaneous funding of both the physical and biological sciences in the study of fisheries oceanography in the eastern Bering Sea and northern Pacific Ocean. The goal of FOCI is to better understand the causes of variations in abundance of fish and shellfish populations with an emphasis on recruitment and year-class phenomena. The long-range objective is to improve prediction of changes in abundance before recruitment to the harvestable populations.

FOCI incorporates the Fishery Oceanography Experiment (FOX), which was begun in 1985 (Wilson et al., 1986), as well as other studies relating to fisheries oceanography. This report summarizes major field sampling activities conducted under FOCI during FY 1986 (October 1985–September 1986), including the work on Shelikof Strait pollock (FOX) and the ecology of pollock over the Aleutian Basin, eastern Bering Sea (Recruitment Investigations in the Bering Sea: RIBS).

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² NOAA/Northwest and Alaska Fisheries Center

The objectives of FOX cruises were to continue time-series observations at selected sampling sites, to chart the distribution and abundance of pollock eggs (April) and larvae (May), and to expand research on specific aspects of the regional physics and biology. The latter included Lagrangian drifter measurements, satellite observations and fine-scale plankton measurements. The RIBS cruise was undertaken to examine the depth and location of pollock spawning in the Aleutian Basin, to compare this spawning with patterns over the eastern Bering Sea shelf, and to examine transport dynamics that may link the two regions via larval drift.

2. FOCI 86 RESEARCH CRUISES

FOX used an established grid of sampling stations for CTD casts, current meters and remote weather stations (Fig. 1). RIBS does not have a fixed sampling pattern at this time. An abstract of research cruises and cruise sampling activities during FY 86 is given in Table 1. Materials and methods are summarized in Sec. 3 and details of the cruises and other sampling efforts are provided in Secs. 4 through 8.

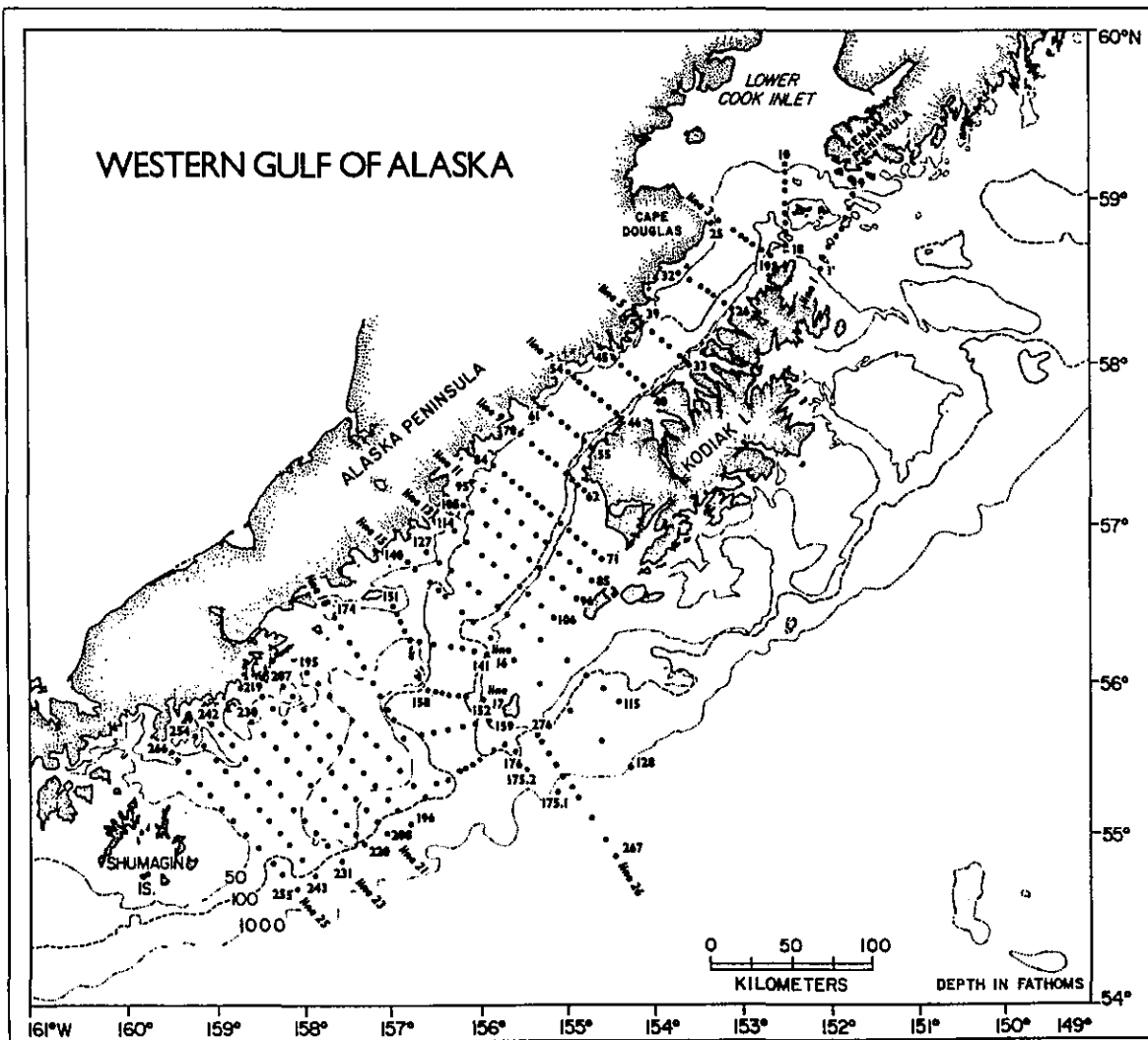


Fig. 1A.--FOX master station numbers.

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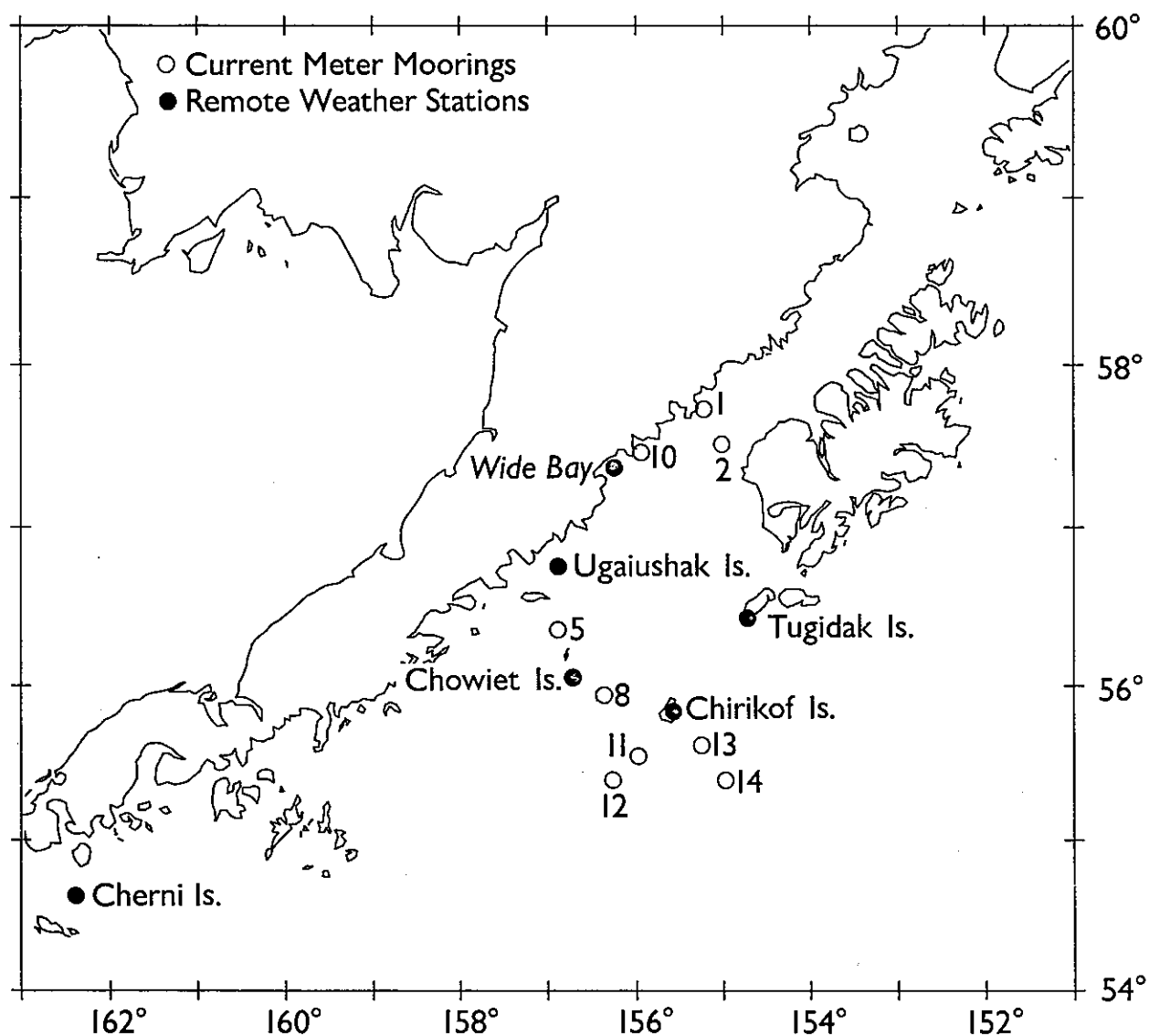


Fig. 1B.--Remote weather stations and current meters during FY 1986.

Table 1. FOCI Research Cruises and Cruise Sampling Activities during FY 1986^{1,2}

Vessel, Cruise, Dates Project Cruise Name	Sampling Activities											
	CTD	B	b	CB	MOC	T	CAM	MZ	N	Chl	MWT	Other
Miller Freeman, MF85-10, 01 OCT - 02 NOV 1985 (FOX 86-I)	193	6							12 (108)			Deploy 8 CM moorings (50 meters, 8 pressure gauges)
Miller Freeman, MF86-02, 02 FEB- 03 MAR 1986 (RIBS 86-I)	51	48				4 (8)					2	Monitored Acoustic sub- surface scattering at 38 kHz; deployed 6 SD; obtained egg specific gravity measurements.
Miller Freeman, MF86-04, 02-13 APR 1986 (FOX 86-II)	12	81		16 (80)							4	Sampled 3 RTD stations; obtained 49 egg specific gravity measurements.
Miller Freeman, MF86-06, 01-19 MAY 1986 (FOX 86-III)	77	108	9		16 (128)		13	11 (66)	17 (136)	1 (7)		25 ADCP records; 10 live collections; deploy 3 STD; sampled one 4-d RTD station; weather ground-truth at Ugaiushak Is
Oceanographer, RP-22-OC-86, 28 JUL - 16 AUG 1986 (FOX 86-IV)	136 (179)	7	2						15 (131)			Recovered 8 CM moorings from FOX 86-I; Deployed 4 CM moorings (16 meters, 4 pressure gauges); 4 TSUNAMI BPRs; continuous ADCP record
TOTAL:	469 (512)	250	11	16 (80)	16 (128)	4 (8)	13		44 (375)		6	

¹Number of stations sampled is given for each category; the number of samples obtained is the same except where given in parentheses.

²CTD = Conductivity/Temperature/Depth cast; B = 60-cm bongo sampler; b = 20-cm bongo; CB = Clarke-Bumpus sampler; MOC = MOCNESS; T = Tucker trawl; CAM = Ortnet net-camera; MZ = microzooplankton; N = nutrients; Chl = chlorophyll; MWT = midwater trawl; CM = current meter; STD = satellite-tracked drifter; RTD = radar-tracked drifter; ADCP = acoustic doppler current profiler; BPR = bottom pressure recorder mooring.

3. MATERIALS AND METHODS

3.1. Shipboard Sampling

There were four cruises that conducted sampling for FOX in FY 1986 (designated FOX 86-I through IV) and one for RIBS. These are summarized in Table 1 and detailed in Sec. 4. Materials and methods of sampling were as follows except where specifically noted otherwise in Sec. 4.

Meteorological Surface Observations

Ship personnel conducted hourly measurements of surface meteorological variables during all cruises. Sea-level pressure was determined from an aneroid barometer, air temperature and wet-bulb temperature from sling psychrometer readings on the upwind bridge wing, wind speed and direction from a Bendix-Friez aerovane mounted on the mast head, and sea-surface temperature from the ship's seawater-intake port or bucket thermometer. All sensors were calibrated before each cruise by the Seattle National Weather Service port meteorological officer; calibrations are traceable to the National Bureau of Standards. Additional estimates of visibility, cloud type, wave and swell height and direction were made when possible.

CTD

The CTD system used on RIBS 86-I, FOX 86-II and FOX 86-III was a 1500 m Grundy Model 9040/9041; the system on FOX 86-I and FOX 86-IV was a Seabird SBE-9. Temperature and salinity field correction samples were obtained on most casts, usually near the bottom of the cast. Temperature was sampled via reversing thermometers; salinity samples were analyzed on an Autosal salinometer aboard ship.

Nutrients and Chlorophyll

Nutrient and chlorophyll samples for FOX were obtained from 10-L Niskin bottles deployed with a rosette sampler/CTD system and tripped at 0, 10, 20, 30, 50, 75, and 100-m depths. Additional nutrient samples were taken below 100 m, usually at 50-m intervals. The deepest samples were taken approximately 15 m from the bottom. Chlorophyll samples for RIBS were collected at 10-m intervals from surface to 80 m.

Nutrient samples were frozen in 250-ml aged polyethylene bottles and returned to the laboratory where they were analyzed on a Technicon Auto Analyzer™ II (Whitledge et al., 1981). Chlorophyll samples (100 ml) were filtered at sea through 0.45-micrometer Millipore HA acetate filters and frozen. Acetone extraction and fluorometric measurements (Yentsch and Menzel, 1963) were performed after samples were returned from sea.

Plankton

Microzooplankton were sampled with 10-L Niskin bottles tripped at 0, 10, 20, 30, 40, 50, and 60 (for FOX) and 70 and 80 m (for RIBS). Water was filtered through 40-micrometer mesh filter bags that were back-flushed into storage jars with 3% buffered formalin.

Net plankton (including ichthyoplankton) were sampled with 333-micrometer mesh nets. A 60-cm (diameter) bongo collector (Posgay and Marak, 1980) was the most widely used equipment. During FOX 86-III and FOX 86-IV, 20-cm bongo collectors were used with 150- μ m mesh nets for zooplankton at selected stations. Twenty-cm and 60-cm collectors were towed on the same wire approximately 1.5 m apart.

Bongo nets were towed according to MARMAP procedures (Smith and Richardson, 1977) except that tows were made to near bottom or to a maximum

depth of 400 m. Wire angles were monitored throughout all tows and a bathykymograph (BKG) calibrated against the CTD system was used to monitor the depth and trajectory of bongo tows taken during FOX 86-II and III. Volume filtered by the nets was estimated using a General Oceanics flowmeter mounted inside the mouth of each net. Samples were stored in 3% buffered formalin.

An array of five Clarke-Bumpus mechanical opening-closing plankton nets (Paquette et al., 1961) was used on FOX 86 II to investigate the vertical distribution of walleye pollock eggs. The samplers were equipped with 500-micrometer mesh nets and General Oceanic flowmeters. A BKG was attached to the towing wire below the deepest net to monitor the tow profile. During a tow, the nets were set on the wire at 70-m intervals in the closed configuration. When all five nets were thus set and the last one was lowered to 70 m, ship speed was increased to produce a 45° wire angle and achieve nominal starting (sampling) depths of 50, 100, 150, 200 and 250 m. The nets were then opened by messenger and the wire was hauled in at about 2-4 m/min. until the upper net was at the surface. A second messenger was dropped to close the nets, which were then hauled aboard, washed down and the samples processed as with bongo samples.

A MOCNESS (Wiebe et al., 1976) was used to sample the vertical distribution of walleye pollock larvae and zooplankton using 153 µm mesh nets during FOX 86-III. Nets were opened and closed to sample the following nominal depth intervals, as allowed by station depth: 0-15, 15-30, 30-45, 45-60, 60-80, 80-100, 100-150 and 150-200 m. Volume, depth, temperature and fluorescence were monitored throughout the tows.

An *in situ*, silhouette photography, towed sampling system (referred to hereafter as the Ortner net-camera: Ortner et al., 1981) was used during FOX 86-III to sample small-scale (order 8 m) patchiness in the abundance of

major zooplanktonic taxa. The instrument was towed obliquely on descent and ascent to within 20 m of bottom and the camera was actuated on the ascent. Flow, conductivity, temperature, depth and fluorescence were continuously monitored.

A device to determine the specific gravity of live planktonic fish eggs (Coombs, 1981) was used during RIBS 86-I and FOX 86-II.

A Diamond midwater trawl (Nelson and Nunnalee, 1986) was fished on RIBS 86-I and FOX 86-II at depths and locations where an echosounder (Simrad 38 kHz) showed sign of fish. Tows were about a half hour in duration and were made according to standard procedures aboard the *Miller Freeman*. Samples of fish were taken for studies of reproductive biology, stomach contents and density (specific gravity) of eggs (both cruises) and for obtaining tissue samples for electrophoresis (RIBS).

Shipboard Current Measurements

An RD Instruments Acoustic Doppler Current Profiler was deployed during MOCNESS and net-camera tows of FOX 86-III. The transducer was a 300 kHz unit equipped with an on-board gyroscopic pitch-roll sensor and linked to a microcomputer. Acoustic measurements of horizontal shear were sought to examine the potential for shear dispersion within the diurnal migrating range of larval pollock and zooplankton.

An acoustic doppler current profiler (RD Instruments - 150 kHz) attached to the hull of the *Oceanographer* during FOX 86-IV was operating for the entire cruise. Occasional problems with the pitch and roll gyro produced sporadically poor data throughout the cruise record.

3.2. Moored Instruments

During October 1985, six current meter moorings were deployed in the Shelikof Sea valley and two were deployed on the continental slope south of Chirikof Island (see Sec. 5.0). Seven of the moorings had a grouping of meters located at about 26 m depth, the groupings were configured as follows. Neil Brown acoustic current meters were located just above Aanderaa RCM-4 current meters with paddle wheel rotors, which in turn were located just above Aanderaa meters with standard rotors. One mooring also had an InterOcean S-4 electromagnetic current meter just below the Neil Brown. This field test was designed to determine if the paddle wheel rotors reduce "wave induced overspeeding" and are less subject to biological fouling than the standard rotor. It was also our initial test of the electromagnetic current meter. All other current meters were standard Aanderaa RCM-4's. Bottom pressure gauges were mounted on all moorings. On mooring #10, one gauge was located on the anchor and one on the acoustic release to determine the extent to which mooring motion affects bottom pressure measurements.

All Aanderaa current meters and bottom pressure gauges were set at a one-hour sample interval. The pressure gauges were sampled instantaneously once each hour. Aanderaa current direction, temperature, pressure and conductivity were instantaneous samples; current speed was averaged over the hour. The Neil Brown meters averaged u and v current components over a 10-minute period and recorded the average every 10 minutes; temperature was instantaneously sampled every 10th 10-minute interval and the 10 previous sampling times were backfilled with this value. The electromagnetic current meter recorded the u and v current components averaged over five minutes once per hour (the S-4 leaked within two months of deployment).

Four bottom pressure recorders were deployed during FOX 86-IV in the Shumagin Gap seismic region. The deployment was a coordinated effort of FOCI and TSUNAMI researchers at PMEL. The recorders are at depths of about 2500 m and record a 56.25 second average of the pressure every 56.25 seconds.

3.3. Remote Weather Stations

During the fiscal year, seven remote weather stations operated at six sites along the Alaska Peninsula. Two stations were originally installed in 1984 for the Outer Continental Shelf Environmental Assessment Program (OCSEAP) Research Unit 666. The remaining five stations were installed in September 1986 and comprised the mesoscale meteorological network METNET. A summary of remote weather station operations is contained in Sec. 6. Station names, locations, elevations and deployment dates are given in Table 8.

A station on Cherni Island, 65 km south of Cold Bay, sampled hourly measurements of surface wind, air pressure, and air temperature from the beginning of the fiscal year until mid-February. Winds were measured at 6 m and temperature and pressure at 2 m above station elevation. Sensors employed were an R.M. Young 05103 wind monitor, a Paroscientific 215-AW-002 digiquartz pressure sensor, and a YSI 44212 thermistor mounted in a radiation shield. The meteorological sensors were connected to a Synergetics 3400 data collection platform that averaged and transmitted the data. Winds were averaged over a 12-minute interval centered on the hour; pressure and temperature were sampled instantaneously at the end of the wind averaging period. Data were transmitted to the GOES-West satellite every three hours.

On April 14, a remote weather station was deployed on Ugaiushak Island. This platform was located at the same site occupied during the previous spring for OCSEAP research. Station configuration, data averaging and transmission

were similar to the Cherni Island station. Independent monitoring of Ugaiushak Island data transmissions by the National Weather Service suggested that a correction of +5.0 mb be applied to station pressure to compute sea-level pressure.

Five remote weather stations, including one which replaced the Ugaiushak Island station described above, were deployed during September 1986 to form a meteorological network (METNET). The four new sites were Wide Bay, Chowiet Island, Chirikof Island, and Tugidak Island (Fig. 1B). Each station consisted of a Handar 430A wind speed sensor, a Handar 431A wind direction sensor (both certified by the National Weather Service), a Handar 432A temperature probe, a Handar 435A relative humidity sensor, and a Setra 270B pressure transducer. Winds were measured 6 m above station elevation, temperature and humidity 2 m above station elevation, and pressure was referenced to sea level. Signals from the sensors were averaged hourly and transmitted to the GOES-West satellite every three hours by a Handar 540A multiple access data acquisition system.

3.4. Drifter Studies

Two types of drifters were used in 1986. Radar-tracked drifters were deployed during two cruises for short-term (2-4 d) work around the drifter's position. The frequency of position fixes on these drifters and depth of the drogue varied between cruises (see Sec. 4 for details). Drogues were 10 m x 2 m canvas "window-shades" connected to a surface buoy by 5/8" polypropylene line. Buoys were equipped with a flashing light and "Racon" radar transponder or radio-direction-finder (RDF) transmitter.

Fifteen satellite-tracked drifters were deployed from research vessels (11 drops) and from U.S. Coast Guard helicopters (4 drops). The 7100 and 2300

series drifters (see Sec. 7) were from Coastal Climate, Inc., Seattle, and used two 20-m long pieces of 1" diameter nylon rope cross-connected at 5-m intervals for the drogues. Drogues were weighted with chain and connected to surface buoys with 3/16" cable. The 5600 series constructed by Horizon Marine, Inc., Marion, MA, used a "hole-filled sock" for the drogue. Slippage of the devices relative to water motion was estimated to be less than 10%. Positions were reported via ARGOS. Drogue depths are discussed in cruise summaries (Sec. 4) and listed in Table 9.

3.5. Satellite Imagery

A search of historical satellite data was conducted during 1986 at the NOAA NESDIS/satellite Data Services Division (SDSD) in Suitland, MD. Hard copy images and some digital data tapes from this search are stored in the FOCI satellite data archive at PMEL (Table 10a). The tapes contain navigated (i.e., they have the geographic positioning associated with the image) Advanced Very High Resolution Radiometer (AVHRR) data. There may be problems in acquiring the digital tapes for all of these images since not all data are stored in this format. In addition to the SDSD imagery, digital satellite data tapes have been saved from the Gilmore Creek, Alaska satellite data receiving station for the period Feb-May, 1986 (Table 10b). These tapes contain "unnavigated" AVHRR data that were collected real-time as the satellite was in sight of the dish at Gilmore Creek. All the imagery saved from these two sources was selected based on clear skies over Shelikof Strait and the surrounding area. Similarly, Coastal Zone Color Scanner (CZCS) data were saved for Shelikof Strait (Table 10c).

4. SHIP CRUISE SUMMARIES

This section provides a brief summary of the objectives and activities of each cruise. A figure showing all sampling stations is provided to depict the general study area of each cruise. A table lists all sampling activities and locations for each cruise. Abbreviations follow those used in Table 1. Cruise station numbers are those assigned during the cruise by the cruise Chief Scientist. FOX station numbers (when given) refer to FOX master station (reference station) numbers which are shown in Fig. 1A. These stations are located on transects which are referred to by line number, beginning with line 1 (Stations 1-9) and proceeding westward to line 25. Numbering begins at the seaward end of each line. RIBS has not established a master station grid at this time. Cruises are listed in chronological order.

4.1. FOX 86-I

Scientific party: James Schumacher, PMEL, Chief Scientist
Judith Gray, PMEL
Thomas Jackson, PMEL
Andrew Roach, PMEL

The objectives of this cruise, from 1 to 25 October 1985, were to: (1) deploy 8 current meter moorings; (2) conduct an extensive hydrographic survey; and (3) collect time-series bongo and nutrient samples from selected stations. All eight current meter moorings (six in the sea valley, two on the slope) were successfully deployed, with a total of 42 Aanderaa mechanical current meters, 7 Neil Brown acoustic meters and 1 InterOcean electromagnetic meter. Acoustic and electromagnetic meters were arranged for cross-calibration with the mechanical meters. Current meter mooring locations and configurations are specified in Table 7. One hundred ninety-three CTD casts were made, 60-cm bongo samplers were towed at 6 stations, and nutrients were

sampled at 12 stations. Figure 2 shows station locations; Table 2 summarizes station locations and operations.

4.2. RIBS 86-I

Scientific party: Kevin Bailey, NWAFC, Chief Scientist
Carol Coho, NOAA Corps, PMC
Robert Francis, UW
Sarah Hinckley, NWAFC
Jim Schumacher, PMEL
Caron Stehr, NWAFC

This was the first FOCI cruise of Recruitment Investigations in the Bering Sea (RIBS) and extended from 2 February to 3 March 1986. The objective of the cruise was to locate and sample aggregations of spawning pollock over the Aleutian Basin in order to: 1) examine reproductive biology; and 2) define biological and physical regimes that might influence transport and survival of early life stages.

The cruise began by occupying 7 CTD stations on FOX line 8 (see Stations 55-51, Fig 1) in Shelikof Strait. After passing through Unimak Pass, the color sounder interfaced with the 38-kHz echosounder was continuously monitored for fish sign. Bering Sea stations are illustrated in Fig. 3, and cruise operations are summarized in Table 3.

Transects were previously determined based on locations of spawning pollock in 1983-85 as logged by observers on foreign fishing vessels. Large aggregations of pollock were sporadically observed along the transect lines. Reports of foreign fishing vessel locations by the U.S. Coast Guard's aerial surveys and by one report from a foreign fisheries observer were useful in locating aggregations of fish.

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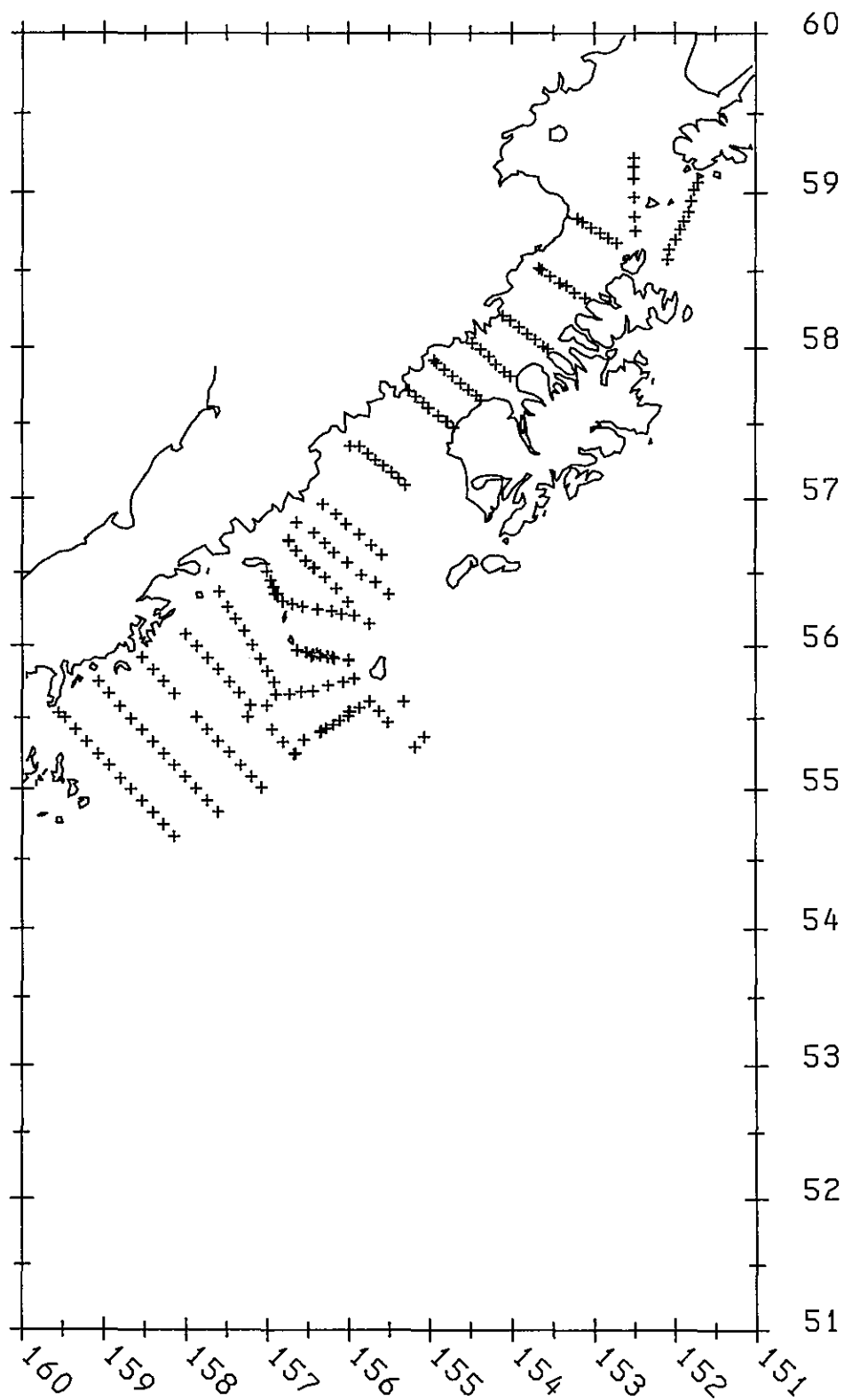


Fig. 2.--Station locations, FOX 86-I.

Table 2. Dates, times and positions of sampling stations and summary of activities during FOX 86-I. See Table 1 for abbreviations.

GMT ----- JD	Date	GMT	Sta. No.	FOX Sta. No.	Lat. N. (dd mm.m)	Long. W. (ddd mm.m)	Activities & Comments
281		0324	1	175.1	55 17.80	155 10.61	CTD
		0624	2	175.2	55 28.01	155 30.65	CTD
		0759	3	176	55 32.64	155 37.12	CTD
		0855	4	177	55 36.85	155 44.14	CTD
		0943	5	178	55 34.10	155 51.60	CTD
		1037	6	179	55 30.67	155 59.90	CTD
		1121	7	180	55 28.81	156 06.40	CTD
		1210	8	181	55 26.94	156 11.22	CTD
		1252	9	182	55 25.50	156 16.55	CTD
		1333	10	183	55 23.91	156 20.48	CTD
		1430	11	184	55 20.68	156 32.63	CTD
		2105	12	185	55 15.06	156 39.00	CTD
282		1711	13	158	55 58.06	156 38.03	CTD
		1819	14	157	55 57.27	156 31.42	CTD
		1922	15	156	55 56.32	156 25.95	CTD
		2013	16	155	55 55.90	156 20.91	CTD
		2108	17	154	55 55.14	156 15.07	CTD
		2202	18	153	55 54.60	156 10.93	CTD
		2306	19	152	55 53.71	156 00.09	CTD
283		0135	20	159	55 46.21	155 56.14	CTD
		0231	21	141	56 12.29	155 55.62	CTD
		2331	22	142	56 13.04	156 05.08	CTD
284		0023	23	143	56 14.22	156 12.19	CTD
		0122	24	144	56 14.88	156 22.57	CTD
		0220	25	145	56 16.03	156 33.65	CTD
		0312	26	146	56 17.12	156 41.29	CTD
		0348	27	147	56 18.14	156 48.39	CTD
		0428	28	148	56 21.41	156 51.92	CTD
		0504	29	149	56 24.14	156 55.32	CTD
		0538	30	150	56 26.72	156 57.17	CTD
		0622	31	151	56 30.07	157 00.13	CTD
		0859	32	M5 ¹	56 20.98	156 53.24	Deploy CM mooring
		1336	33	M8	55 56.78	156 23.00	Deploy CM mooring
		1755	34	M12	55 24.34	156 19.99	Deploy CM mooring
		2041	35	M11	55 32.61	155 59.50	Deploy CM mooring
		2145	36	M11	55 32.38	155 58.82	CTD, N
		2336	37	M12	55 24.14	156 20.03	CTD, N
285		0117	38	185	55 14.71	156 40.14	CTD
		0216	39	186	55 19.82	156 48.20	CTD
		0314	40	187	55 25.17	156 56.32	CTD

¹"M" denotes current-meter-mooring station

Table 2. Continued

GMT Date ----- JD	GMT	Sta. No.	FOX Sta. No.	Lat. N. (dd mm.m)	Long. W. (ddd mm.m)	Activities & Comments
286	0400	41	188	55 30.17	157 14.19	CTD
	0448	42	189	55 35.07	157 12.26	CTD
	0546	43	190	55 40.34	157 20.40	CTD
	0635	44	191	55 44.88	157 28.12	CTD
	0736	45	192	55 50.04	157 36.19	CTD
	0829	46	193	55 54.74	157 44.03	CTD
	0928	47	194	55 59.62	157 52.01	CTD
	1027	48	195	56 04.67	158 00.09	CTD
	1250	49	173	56 22.09	157 35.10	CTD
	1345	50	172	56 15.78	157 29.06	CTD
	1447	51	171	56 10.91	157 23.34	CTD
	1539	52	170	56 05.90	157 16.90	CTD
	1633	53	169	55 59.97	157 11.03	CTD
	0031	54	159	55 46.34	155 56.12	CTD
	0117	55	160	55 44.80	156 04.13	CTD
	0214	56	161	55 43.49	156 15.33	CTD
	0344	57	162	55 41.09	156 25.79	CTD
	0432	58	163	55 40.86	156 34.61	CTD
	0526	59	164	55 39.86	156 43.16	CTD
	0619	60	165	55 39.75	156 53.14	CTD
	0701	61	166	55 44.79	156 55.07	CTD
	0752	62	167	55 49.46	157 00.14	CTD
	0844	63	168	55 54.27	157 05.19	CTD
	1127	64	M5	56 21.21	156 54.21	CTD
	1351	65	139	56 42.83	156 44.16	CTD
	1453	66	138	56 38.83	156 38.38	CTD
	1553	67	137	56 34.80	156 31.20	CTD
	1642	68	136	56 31.74	156 25.32	CTD
287	0155	69	M13	55 36.75	155 18.72	Deploy CM mooring
	0553	70	M14	55 22.13	155 03.75	Deploy CM mooring
	1239	71	208	55 00.28	157 04.43	CTD
	1340	72	209	55 04.97	157 11.86	CTD
	1447	73	210	55 09.94	157 19.66	CTD
	1543	74	211	55 15.39	157 27.89	CTD
	1636	75	212	55 19.99	157 36.14	CTD
	1726	76	213	55 25.04	157 44.20	CTD
	1819	77	214	55 30.25	157 51.95	CTD
	1915	78	215	55 35.16	157 00.13	CTD
	2012	79	216	55 40.03	158 08.08	CTD
	2103	80	217	55 45.23	158 16.44	CTD
	2155	81	218	55 50.05	158 24.03	CTD
	2259	82	219	55 55.12	158 32.04	CTD
288	0103	83	242	55 45.02	159 04.03	CTD
	0158	84	241	55 40.09	158 56.07	CTD
	0252	85	240	55 34.82	158 48.14	CTD

Table 2. Continued

GMT Date ----- JD	GMT	Sta. No.	FOX Sta. No.	Lat. N. (dd mm.m)	Long. W. (ddd mm.m)	Activities & Comments
	0356	86	239	55 29.60	158 40.04	CTD
	0450	87	238	55 24.90	158 31.98	CTD
	0548	88	237	55 19.89	158 23.96	CTD
	0645	89	236	55 14.84	158 15.95	CTD
	0744	90	235	55 10.07	158 08.50	CTD
	0836	91	234	55 05.11	158 00.49	CTD
	0932	92	233	55 00.12	157 52.48	CTD
	1025	93	232	54 54.95	157 44.49	CTD
	1127	94	231	54 50.10	157 36.42	CTD
	1400	95	255	54 39.74	158 08.25	CTD
	1512	96	256	54 44.87	158 16.60	CTD
	1607	97	257	54 49.94	158 24.20	CTD
	1708	98	258	54 54.90	158 32.29	CTD
	1800	99	259	55 00.02	158 40.47	CTD
	1854	100	260	55 04.69	158 48.00	CTD
	1947	101	261	55 09.92	158 56.22	CTD
	2045	102	262	55 14.61	159 04.19	CTD
	2144	103	263	55 19.82	159 12.50	CTD
	2240	104	264	55 24.98	159 20.55	CTD
	2328	105	265	55 29.98	159 28.19	CTD
289	0027	106	266	55 31.94	159 32.81	CTD
	1423	107	158	55 58.16	156 37.72	CTD
	1515	108	157	55 57.25	156 30.96	CTD, N
	1620	109	156	55 56.32	156 26.32	CTD
	1656	110	156	55 55.59	156 27.48	B
	1751	111	M8	55 56.73	156 23.19	CTD
	1906	112	154	55 55.68	156 15.54	CTD, N
	2014	113	154	55 55.38	156 15.70	B
	2101	114	153	55 55.24	156 11.95	CTD
	2152	115	152	55 54.18	156 00.14	CTD
290	0249	116	139	56 43.10	156 44.21	CTD
	0335	117	138	56 38.75	156 38.35	CTD
	0432	118	137	56 34.57	156 31.49	CTD
	0515	119	136	56 31.91	156 24.97	CTD
	0610	120	135	56 27.98	156 17.06	CTD
	0702	121	134	56 23.54	156 08.89	CTD
	0805	122	133	56 17.89	156 00.29	CTD
	0929	123	132	56 09.01	155 44.45	CTD
	1100	124	120	56 21.16	155 29.80	CTD
	1157	125	121	56 26.06	155 39.79	CTD
	1259	129	122	56 28.97	155 49.99	CTD
	1404	127	123	56 34.10	156 00.44	CTD
	1511	128	124	56 38.12	156 10.42	CTD
	1601	129	125	56 41.91	156 17.55	CTD
	1717	130	126	56 46.07	156 25.53	CTD

Table 2. Continued

GMT Date ----- JD	GMT	Sta. No.	FOX Sta. No.	Lat. N. (dd mm.m)	Long. W. (ddd mm.m)	Activities & Comments
	1816	131	127	56 50.28	156 38.40	CTD
	1949	132	114	56 57.68	156 18.81	CTD, N
	2111	133	113	56 53.63	156 09.22	CTD
	2209	134	112	56 49.55	156 01.87	CTD, N
	2345	135	111	56 45.43	155 52.08	CTD
291	0048	136	110	56 41.02	155 43.31	CTD
	0144	137	109	56 37.20	155 34.93	CTD
293	2156	142	M10	57 21.07	155 58.77	Deploy CM mooring
294	0136	138	M1	57 42.97	155 15.69	Deploy CM mooring
	0221	139	61	57 43.20	155 15.50	B
	0344	140	58	57 36.25	155 00.23	B
	0457	141	56	57 31.05	154 46.67	B
	0606	143	55	57 28.50	154 42.03	CTD
	0653	144	56	57 30.95	154 47.30	CTD, N
	0746	145	57	57 33.20	154 53.11	CTD
	0838	146	58	57 36.27	155 00.74	CTD, N
	0928	147	59	57 38.47	155 04.61	CTD
	1017	148	60	57 40.83	155 10.43	CTD
	1102	149	61	57 42.94	155 15.56	CTD, N
	1352	150	84	57 20.90	155 51.43	CTD
	1431	151	83	57 18.02	155 45.47	CTD
	1523	152	82	57 15.48	155 40.05	CTD
	1609	153	81	57 13.16	155 34.18	CTD
	1657	154	80	57 10.50	155 28.10	CTD
	1748	155	79	57 08.09	155 22.62	CTD
	1833	156	78	57 05.34	155 17.85	CTD
	2222	157	46	57 39.24	154 22.61	CTD
	2258	158	47	57 41.07	154 25.81	CTD
	2333	159	48	57 43.47	154 31.58	CTD
295	0024	160	49	57 45.99	154 37.52	CTD
	0101	161	50	57 48.86	154 43.08	CTD
	0145	162	51	57 51.43	154 49.17	CTD
	0225	163	52	57 54.02	154 54.93	CTD
	0251	164	53	57 55.16	154 56.92	CTD
	0458	165	45	58 01.70	154 28.59	CTD
	0543	166	44	57 59.43	154 22.50	CTD
	0643	167	43	57 56.59	154 16.55	CTD
	0731	168	42	57 53.43	154 11.65	CTD
	0825	169	41	57 50.47	154 05.54	CTD
	0902	170	40	57 48.80	154 00.98	CTD
	1053	171	33	57 59.41	153 33.83	CTD
	1121	172	34	58 00.47	153 37.46	CTD
	1216	173	35	58 03.17	153 43.03	CTD
	1254	174	36	58 05.37	153 48.94	CTD
	1338	175	37	58 07.98	153 54.74	CTD

Table 2. Continued

GMT Date ----- JD	GMT	Sta. No.	FOX Sta. No.	Lat. N. (dd mm.m)	Long. W. (ddd mm.m)	Activities & Comments
	1417	176	38	58 10.60	154 01.01	CTD
	1502	177	39	58 12.44	154 06.73	CTD
	1828	178	32	58 30.92	153 40.07	CTD
	1854	179	31	58 30.23	153 37.97	CTD
	1936	180	30	58 27.66	153 32.18	CTD
	2033	181	29	58 25.31	153 25.34	CTD
	2121	182	28	58 24.22	153 20.05	CTD
	2209	183	27	58 21.44	153 14.17	CTD
	2249	184	26	58 19.37	153 06.35	CTD
297	2205	185	1	58 34.32	152 05.70	CTD
	2247	186	2	58 38.23	152 04.43	CTD
	2328	187	3	58 41.92	151 59.75	CTD
298	0016	188	4	58 45.84	151 56.20	CTD
	0048	189	5	58 48.94	151 53.51	CTD
	0129	190	6	58 52.57	151 49.88	CTD
	0216	191	7	58 56.81	151 47.92	CTD
	0257	192	8	59 01.00	151 45.95	CTD
	0334	193	9	59 03.86	151 42.85	CTD
	0610	194	10	59 13.26	152 30.17	CTD
	0647	195	11	59 09.82	152 30.51	CTD
	0727	196	12	59 05.34	152 30.65	CTD
	0823	197	14	58 58.25	152 30.29	CTD
	0920	198	16	58 50.76	152 30.11	CTD
	1012	199	18	58 45.29	152 29.59	CTD
	1119	200	20	58 40.60	152 43.61	CTD, N
	1217	201	21	58 42.55	152 49.77	CTD
	1301	202	22	58 44.52	152 55.82	CTD, N
	1348	203	23	58 46.57	153 02.43	CTD
	1427	204	24	58 48.72	153 08.38	CTD
	1515	205	25	58 50.13	153 12.15	CTD, N
	1631	206	26	58 49.90	153 12.26	B

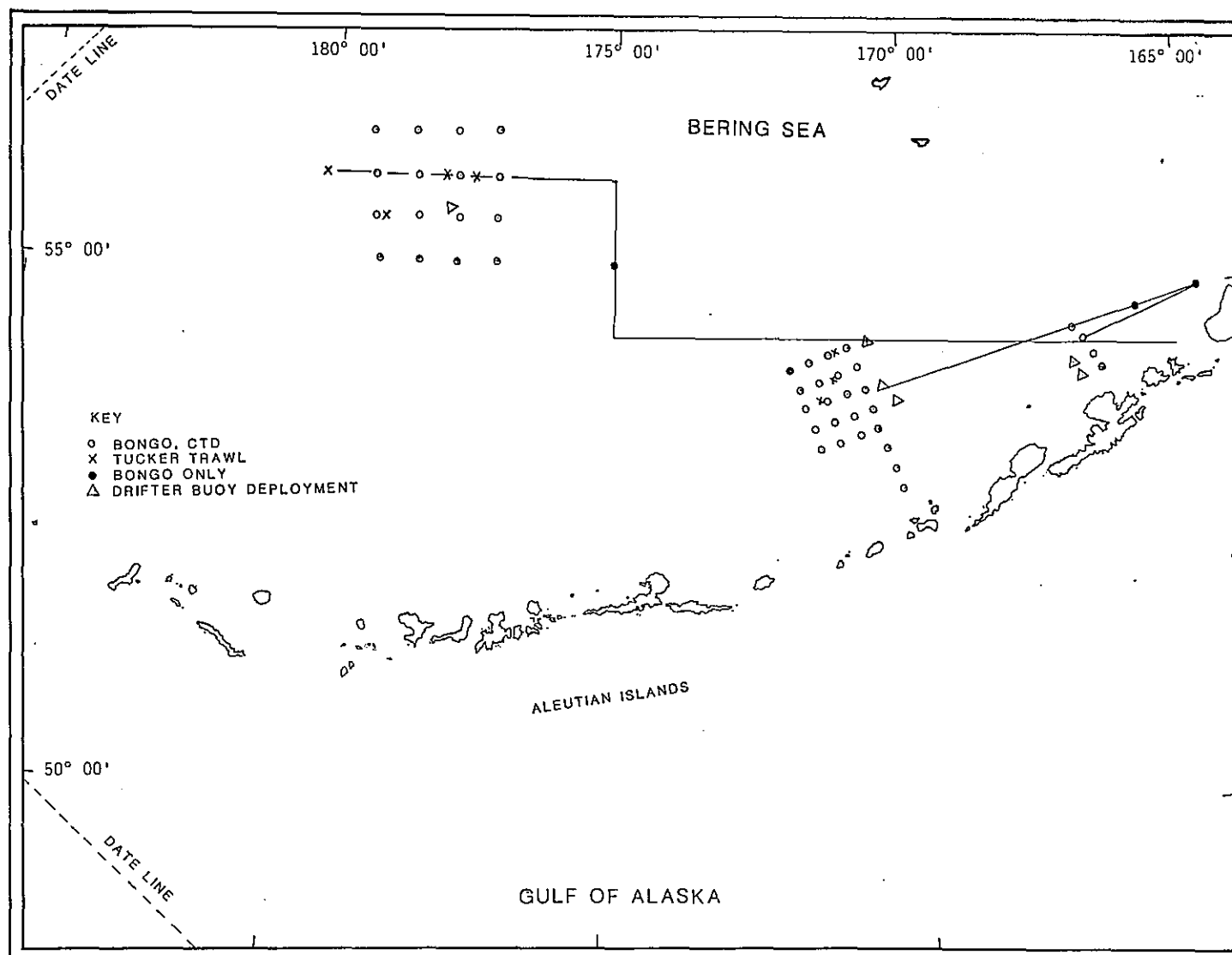


Fig. 3.--Station locations, RIBS 86-I.

Table 3. Dates, times and positions of sampling stations and summary of activities during RIBS 86-I. See Table 1 for abbreviations.

GMT ----- JD	Date	GMT	Sta. No.	FOX Sta. No.	Lat. N. (dd mm.m)	Long. W. (ddd mm.m)	Activities & Comments
42	11 Feb	1655	FX-55		57 28.42	154 41.98	CTD
		1753	FX-56		57 30.98	154 47.03	CTD
		1852	FX-57		57 33.12	154 52.21	CTD
		1958	FX-58		57 36.44	154 59.83	CTD
		2049	FX-59		57 38.89	155 04.55	CTD
		2149	FX-60		57 41.18	155 09.37	CTD
		2251	FX-61		57 43.18	155 15.26	CTD
45	14 Feb	1056	MWT-1		54 15.36	170 11.72	MWT
46	15 Feb	0637	MWT-2		54 15.00	174 55.72	MWT
		0015	MWT-3		55 43.13	177 47.90	MWT
47	16 Feb	0303	Z-1		55 43.92	177 52.53	T, CTD
		1002	MWT-4		55 35.19	177 46.06	MWT
		1628	Z-3		55 41.06	178 59.95	B
		2107	Z-2		55 40.11	179 58.85	B
48	17 Feb	0521	B2		55 40.60	178 00.37	B, CTD
		0910	A2		55 49.85	177 58.55	B, CTD
		0334	A1		55 51.05	178 18.94	B, CTD
		1744	B1		55 39.61	178 18.24	B, CTD
		1949	C1		55 29.97	178 18.24	B, TT, CTD
49	18 Feb	0058	D1		55 20.85	178 18.60	B, CTD
		0505	D2		55 20.25	177 59.25	B, CTD
		1232	C2		55 29.83	177 58.48	B(2), CTD
		2039	C3		55 30.20	177 43.24	B, CTD, STD
50	19 Feb	0027	B3		55 40.24	177 43.39	B, CTD, MWT
		1218	A3		55 50.54	177 42.13	B, CTD
		1548	A4		55 50.51	177 27.73	B, CTD
		1809	B4		55 40.65	177 26.22	B, CTD
		2153	C4		55 30.28	177 25.94	B, CTD
51	20 Feb	0100	D4		55 19.86	177 26.44	B, CTD
		0400	D3		55 20.12	177 43.90	B, CTD
		1516	Z-4		54 56.61	175 06.78	B
52	21 Feb	0654	MWT-6		54 02.00	171 50.11	MWT
		1022	MWT-7		53 48.71	171 29.44	MWT, CTD, T
		2150	L4		53 02.36	170 12.61	B, CTD
53	22 Feb	0213	K4		53 13.07	170 19.58	B, CTD
		0540	J4		53 21.64	170 29.43	B, CTD
		0858	I4		53 30.65	170 37.21	B, CTD
		1254	I3		53 26.29	170 52.13	B, CTD
		1813	I2		53 20.15	171 08.89	B, CTD
		2048	I1		53 15.39	171 24.51	B, CTD

Table 3. Continued

GMT ----- JD	Date	GMT	Sta. No.	FOX Sta. No.	Lat. N. (dd mm.m)	Long. W. (ddd mm.m)	Activities & Comments
54	23 Feb	0021	H1		53 24.32	171 31.22	B, CTD
		0354	H2		53 28.76	171 16.52	B, CTD
		0825	H3		53 33.22	171 00.82	B, CTD
		1116	H4		53 38.36	170 45.98	B, CTD, STD
		1712	G4		53 48.23	170 48.60	B, CTD, STD
		1954	F4		53 59.89	171 03.76	B, CTD
		2327	E4		54 07.94	171 12.71	B, CTD, STD
55	24 Feb	0318	E3		54 02.32	171 27.55	B, CTD, T
		1524	F3		55 53.08	171 19.22	B, CTD
		1827	F2		53 48.06	171 32.95	
56	25 Feb	1112	E2		53 59.35	171 41.15	B, CTD
		1351	E1		53 52.44	171 57.50	B, CTD
		1924	F1		53 45.04	171 48.34	B, CTD
		2347	G1		53 34.54	171 39.03	B, CTD
57	26 Feb	0229	G2		53 38.40	171 25.06	B, CTD, T
		1557	G3		53 43.08	171 10.07	B, CTD
58	27 Feb	1020	DH-1		54 28.24	167 15.82	B, CTD
		1347	Z-8		54 37.18	166 42.07	B
		1755	Z-9		54 45.77	165 54.82	B
59	28 Feb	2355	DH-2		54 18.30	167 09.22	B, CTD, MWT
		0848	DH-3		54 12.01	166 57.44	B, CTD, STD(2)
		1234	DH-4		54 05.19	166 50.42	B, CTD

The transect along line 55°15'N (Fig. 3) intersected a large foreign fishing effort (50-60 vessels) catching pollock in a confined area outside the Fisheries Conservation Zone northeast of Bower's Ridge. A 16-station grid was occupied at this location. At each station, a bongo tow, CTD, and bottle cast (0-80 m) for microzooplankton and chlorophyll were completed. Male pollock in this area were running milt, but female fish were not yet in spawning condition. No eggs were observed in plankton samples. One satellite-tracked drifter was released in this area.

A southern grid of stations near the Islands of Four Mountains was established based on an observer's report of spawning activity. A large aggregation of pollock was located near the center of the grid and three fishing vessels were operating in the area. Fish were actively spawning. Most pollock eggs were located at depths of 300-400 m, and were early in their development. About 100 measurements of egg specific gravity were made. Three satellite tracked drifters were deployed.

The ship then proceeded towards the southeastern shelf of the eastern Bering Sea. An aggregation of spawning fish was located about 20 nm off Unalaska Island. Eggs in the water column were in all stages of development. Two drifters were deployed in this area.

Samples of adult fish were collected for electrophoretic analysis of proteins to determine stock structure from all three regions where aggregations of fish were sampled. In addition, samples were obtained to assess the reproductive biology of fishes in these areas.

4.3. FOX 86-II

Scientific Party: Arthur W. Kendall, NWAFC, Chief Scientist
Richard Bates, NWAFC
Jay Clark, NWAFC
Suam Kim, UW

The objectives of this cruise, from 2-13 April 1986, were to: (1) survey the distribution and abundance of walleye pollock eggs in the FOX study area; (2) measure the specific gravity of planktonic pollock eggs; (3) collect stomachs of adult pollock to assess the impact of cannibalism on egg mortality; (4) collect and freeze a length-sex stratified sample of adult pollock to study reproductive biology; (5) collect temperature and salinity data (CTD) at selected stations; and (6) investigate the vertical distribution of pollock eggs with Clarke-Bumpus samplers.

Bongo tows were made at 81 stations. The station grid was based on historical surveys and on March hydroacoustic assessments of the spawning stock (MILLER-FREEMAN cruise MF 86-03). Samples were examined onboard and extra effort was focused on areas of greatest abundance. Figure 4 shows station locations; Table 4 provides an operations summary.

4.4. FOX 86-III

Scientific party: Lewis Incze, UW & NWAFC, Chief Scientist
Jay Clark, NWAFC
Shailer Cummings, AOML
David Niemann, RSMAS/U. Miami
Peter Ortner, AOML
Debbie Siefert, NWAFC
Corenne Stewart, NWAFC

The objectives of this cruise, conducted from 1 to 19 May 1986, were to: (1) collect zooplankton, hydrographic and nutrient data at FOX time-series stations; (2) conduct a quick survey of the FOX study area to map the distribution and abundance of larval pollock; (3) return to the region of greatest larval abundance to conduct a 2-4 d drogue study, examining vertical

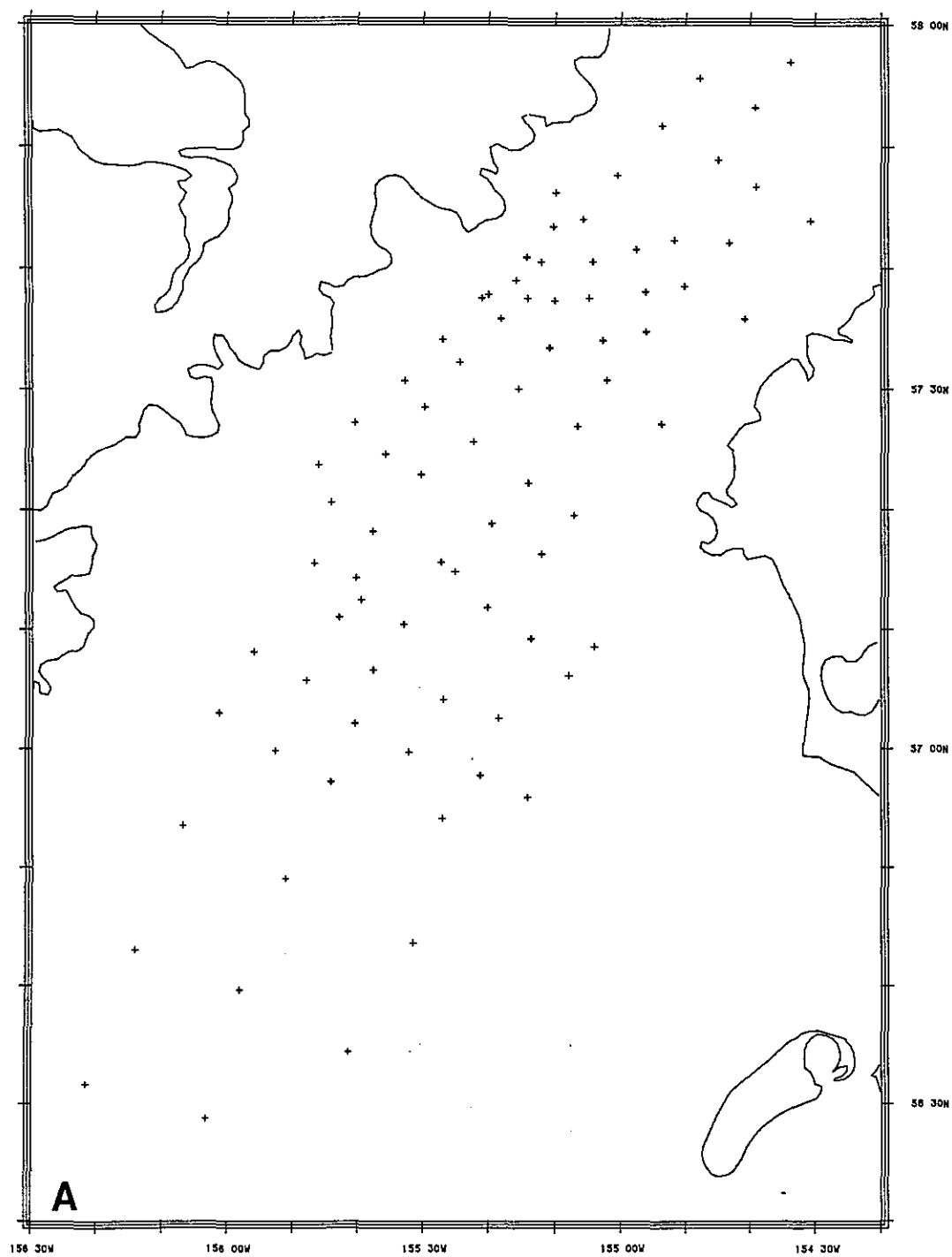


Fig. 4A.--Survey station locations, FOX 86-II.

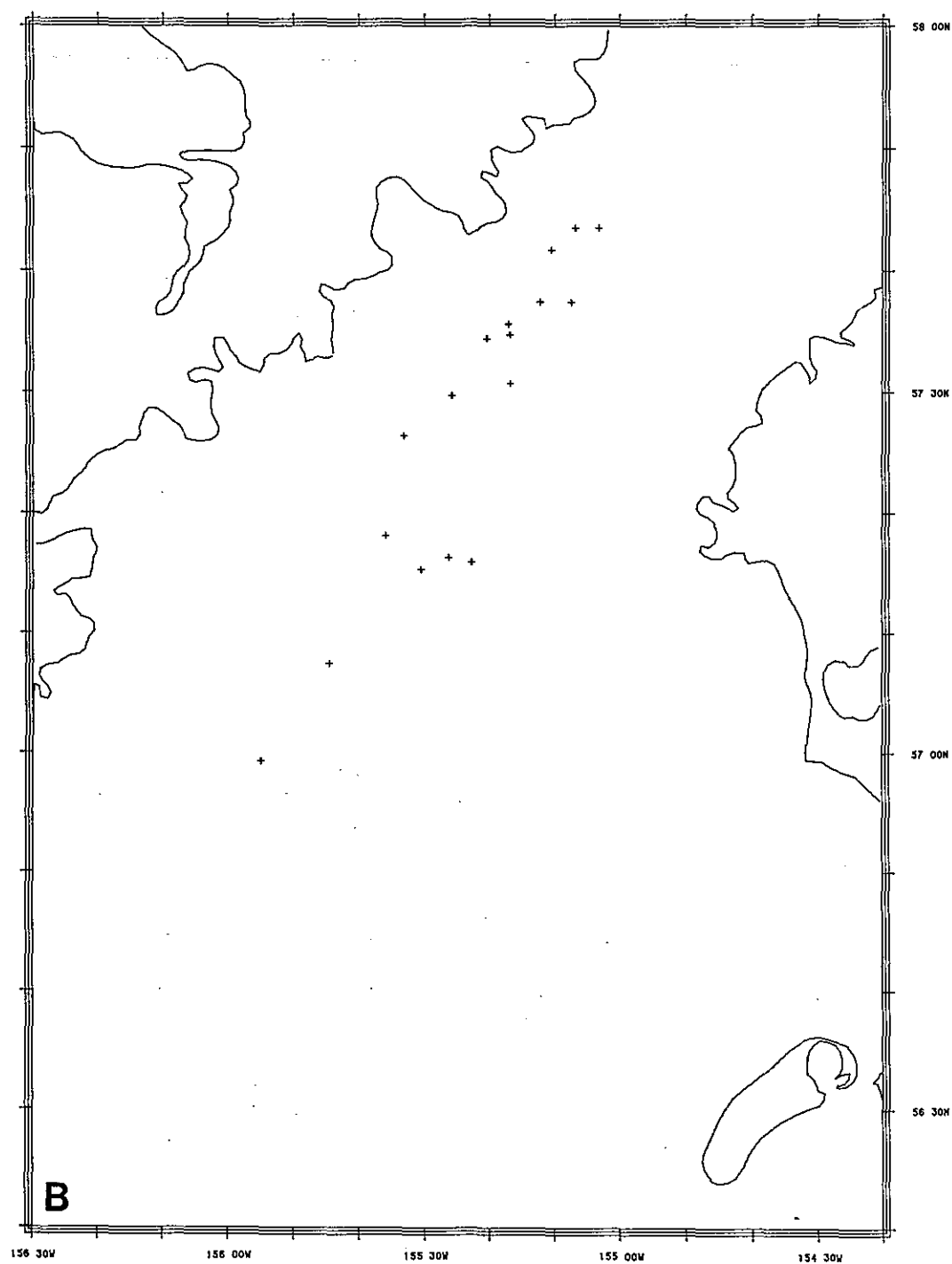


Fig. 4B.--Vertical distribution sampling stations, FOX 86-II.

Table 4. Dates, times and positions of sampling stations and summary of activities during FOX 86-II. See Table 1 for abbreviations.

GMT ----- JD	Date	GMT	Sta. No.	FOX Sta. No.	Lat. N. (dd mm.m)	Long. W. (ddd mm.m)	Activities & Comments
94	04 APR	0445	CAST 1		57 22.8	155 47.5	CTD
		0541	CAST 2		57 20.6	155 41.7	CTD
		0637	CAST 3		57 18.0	155 35.5	CTD
		0730	CAST 4		57 15.6	155 30.4	CTD
		0815	CAST 5		57 14.2	155 24.3	CTD
		0909	CAST 6		57 10.7	155 18.6	CTD
		0954	CAST 7		57 08.8	155 12.8	CTD
		1044	CAST 8		57 05.8	155 06.6	CTD
		1608			57 15.7	155 29.4	Deploy RTD
		1703	P001A		57 15.9	155 22.8	CB
		2013			57 15.9	155 27.8	Recover RTD
		2030	P001A		57 15.6	155 27.4	B
95	05 APR	0046	G001A		57 10.4	155 33.0	B
		0149	G002A		57 06.6	155 37.7	B
		0322	G003A		57 02.1	155 40.6	B
		0427	G004A		56 57.2	155 44.2	B
		0600	G005A		56 49.0	155 51.2	B
		0753	G006A		56 39.6	155 58.2	B
		0950	G007A		56 43.0	156 14.1	B
		1134	G008A		56 53.5	156 06.9	B
		1310	G009A		57 03.0	156 01.4	B
		1418	G010A		57 08.1	155 56.0	B
		1533	G011A		57 05.7	155 48.0	B
		1714	G012A		57 11.0	155 42.9	B
		1810	G013A		57 14.3	155 40.4	B
		1913	G014A		57 18.2	155 37.8	B
		2058			57 15.6	155 30.8	Deploy RTD
		2139	HAUL 1		57 16.6	155 33.9	MWT
96	06 APR	0135	P002A		57 15.3	155 30.6	CB
		0252	HAUL 2		57 15.1	155 30.8	MWT
		0452	G015A		57 14.8	155 25.3	B
		0608	G016A		57 11.8	155 20.2	B
		0712	G017A		57 09.2	155 13.7	B
		0823	G018A		57 06.1	155 08.0	B
		1147	P003A		57 16.3	155 26.3	CB
		1439	G019A		57 20.6	155 44.2	B
		1541	G020A		57 23.7	155 46.1	B
		1836					Recover RTD
		1955	G021A		57 22.9	155 30.4	B

Table 4. Continued

GMT ----- JD	Date	GMT	Sta. No.	FOX Sta. No.	Lat. N. (dd mm.m)	Long. W. (ddd mm.m)	Activities & Comments
97	07 APR	2049	G022A		57 24.6	155 35.8	B
		2216	G023A		57 28.5	155 29.9	B
		0100	G024A		57 32.2	155 24.5	B
		0211	G025A		57 35.8	155 18.2	B
		0308	G026A		57 33.4	155 10.9	B
		0413	G027A		57 37.5	155 05.0	B
		0510	G028A		57 40.5	155 12.2	B
		0618	G029A		57 44.0	155 05.8	B
		0731	G030A		57 41.5	154 57.7	B
		0836	G031A		57 42.3	154 51.8	B
		0933	G032A		57 48.9	154 45.1	B
		1051	G033A		57 53.2	154 39.3	B
		1155	G034A		57 56.9	154 33.8	B
		1312	G035A		57 55.6	154 47.9	B
		1403	G036A		57 51.7	154 53.7	B
		1510	G037A		57 47.6	155 00.5	B
		1617	G038A		57 46.2	155 09.9	B
		1742	G039A		57 40.9	155 14.4	B
		1845	G040A		57 37.5	155 21.2	B
98	08 APR	1955	G041A		57 46.7	154 39.1	B
		2138	G042A		57 38.5	154 50.3	B
		2239	G043A		57 34.7	154 56.1	B
		2342	G044A		57 30.7	155 02.2	B
99	09 APR	0054	G045A		57 30.0	155 15.6	B
		0154	G046A		57 25.6	155 22.5	B
		0309	G047A		57 27.2	155 40.6	B
		0413	G048A		57 30.7	155 32.9	B
		0510	G049A		57 34.1	155 27.1	B
		0620			57 37.8	155 20.2	Deploy RTD
		0621	G050A		57 37.8	155 20.2	B
		0725	CAST 9		57 37.4	155 19.1	CTD
		0928	HAUL 3		57 35.7	155 17.8	MWT
		1044	HAUL 4		57 35.1	155 16.9	MWT
		1325	P004A		57 34.4	155 20.4	CB
		1510	G051A		57 43.4	155 10.3	B
		1613	G052A		57 40.5	155 04.4	B
		1711	G053A		57 38.0	154 56.3	B
		1810	G054A		57 34.0	155 02.8	B
		1910	G055A		57 37.3	155 10.2	B
		1945	P005A		57 37.4	155 07.5	CB
		2232	HAUL 5		57 34.4	155 21.5	MWT
100	10 APR	0433			57 29.6	155 29.2	Recover RTD
		0548	P006A		57 29.7	155 25.8	CB
		0832	G056A		57 39.0	155 16.0	B

Table 4. Continued

GMT ----- JD	Date	GMT	Sta. No.	FOX Sta. No.	Lat. N. (dd mm.m)	Long. W. (ddd mm.m)	Activities & Comments
101	11 APR	0914	G057A		57 37.5	155 14.3	B
		1020	P007A		57 37.4	155 12.3	CB
		1250	P008A		57 43.5	155 03.3	CB
		1620	G058A		57 15.5	155 46.8	B
		1717	G059A		57 12.5	155 39.5	B
		1916	G060A		57 08.5	155 04.1	B
		2359	G061A		56 31.6	156 21.6	B
		0121	G062A		56 28.7	156 03.3	B
		0313	G063A		56 34.4	155 41.4	B
		0445	G064A		56 43.6	155 31.5	B
		0618	G065A		56 54.1	155 27.1	B
		0725	G066A		56 59.7	155 32.2	B
		0849	G067A		56 57.7	155 21.3	B
		0929	G068A		56 55.9	155 14.2	B
		1046	G069A		57 02.5	155 18.6	B
		1150	G070A		57 04.1	155 27.0	B
		1342	G071A		56 59.8	155 52.7	B
		1520	P009A		56 59.3	155 54.9	CB
		1725	P010A		57 07.4	155 44.6	CB
		1940	P011A		57 18.1	155 35.9	CB
		2115	G072A		57 18.8	155 19.6	B
		2211	G073A		57 16.3	155 12.1	B
		2306	G074A		57 19.5	155 07.2	B
102	12 APR	0003	G075A		57 22.2	155 14.1	B
		0105	G076A		57 26.9	155 06.7	B
		0212	G077A		57 27.1	154 53.8	B
		0451	P012A		57 26.4	155 33.2	CB
		0757	CAST 10		57 37.4	155 18.8	CTD
		0855	P013A		57 35.6	155 17.1	CB
		1012	CAST 11		57 36.0	155 17.9	CTD
		1112	P014A		57 34.7	155 16.9	CB
		1218	CAST 12		57 33.2	155 16.4	CTD
		1412	P015A		57 30.7	155 16.8	CB
		1640	P016A		57 43.5	155 06.9	CB
		1857	P016B		57 41.7	155 10.5	CB
		2106	G078A		57 42.1	154 43.3	B
		2206	G079A		57 35.8	154 40.8	B
		2314	G080A		57 43.9	154 30.7	B

distribution of ichthyoplankton, net zooplankton and microzooplankton; (4) examine horizontal shears at MOCNESS tow sites with a ship-mounted doppler current profiler; (5) examine small-scale plankton patchiness (larval feeding environments) with the Ortnet net-camera; (6) deploy satellite tracked drifters; (7) obtain live larval specimens with minimum damage for aging, shrinkage and dry weight studies; (8) conduct CTD casts at FOX current meter moorings; and (9) obtain ground-truth wind speed and direction and atmospheric pressure data in vicinity of remote weather station on Ugaiushak Island. All objectives were met except two MOCNESS tows on FOX line 8. Station locations are illustrated in Fig. 5 and operations are given in Table 5.

4.5. FOX 86-IV

Scientific party: Judith Gray, PMEL, Chief Scientist
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FOX 86-IV (RP-22-OC-86) was conducted aboard the NOAA ship *Oceanographer* from 28 July to 16 August 1986. The principal objectives of this cruise were to recover and deploy long-term current-meter moorings in the FOX region and to occupy the FOX CTD grid to continue long-term monitoring of water properties in Shelikof Strait. Time-series nutrient and zooplankton sampling stations were occupied and two satellite-tracked drifters were deployed at FOX Sta. 60.

Eight moorings were recovered (FOX #1, 5, 8, 10, 11, 12, 13, 14; Fig. 1) and four moorings were deployed (FOX #2, 5, 8, 14; Fig. 1). Upon recovery,

¹joined the ship at the 7 AUG touch-and-go

²left the ship at the 7 AUG touch-and-go

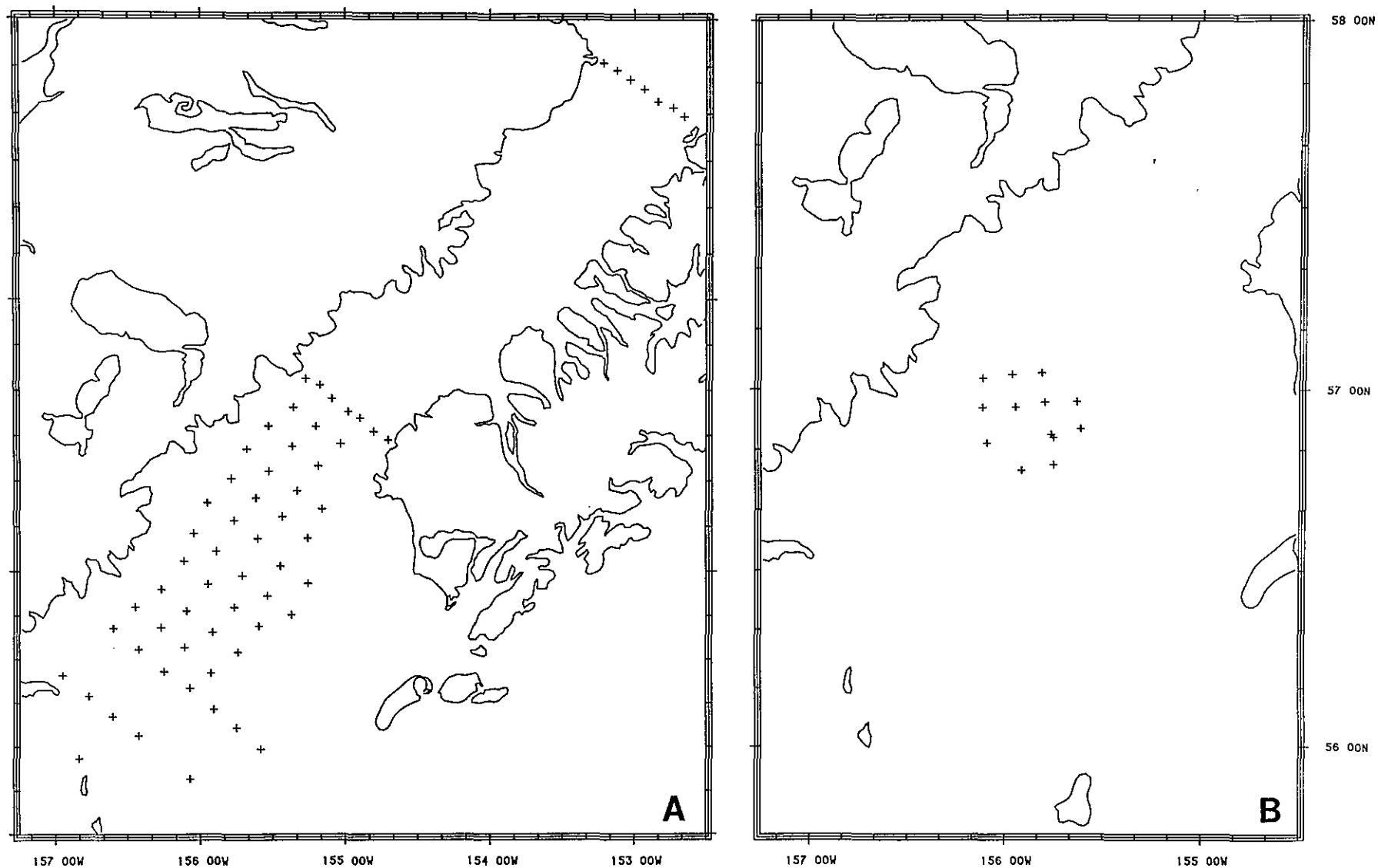


Fig. 5A and 5B.--Station locations, FOX 86-III; A and B show locations for Phases I and II, respectively (see Table 5).

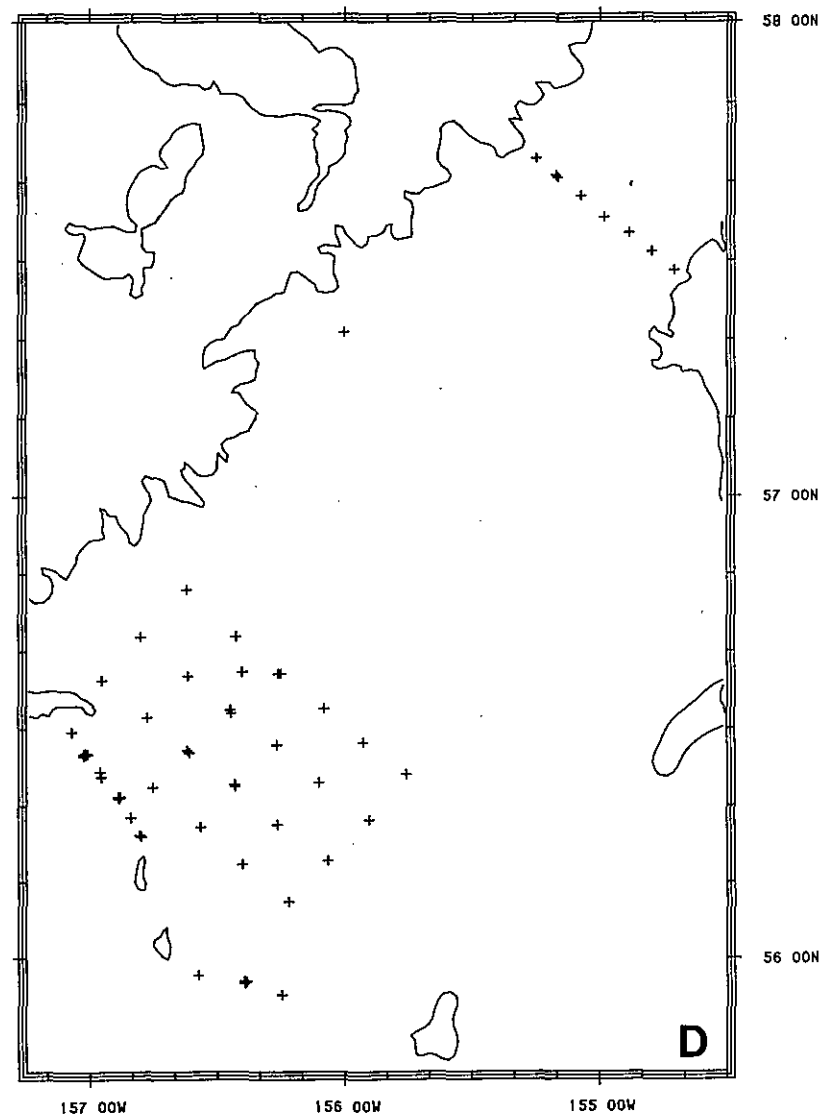
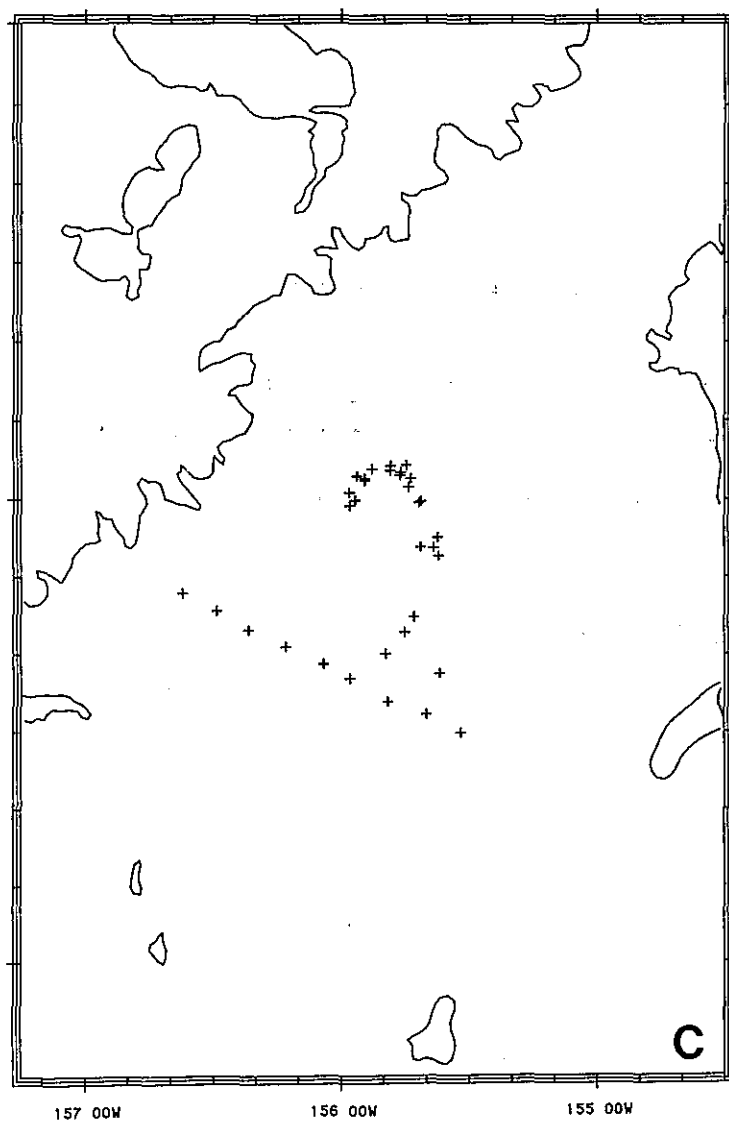


Fig. 5C and 5D.--Station locations, FOX 86-III; C and D show locations for Phases III and IV, respectively (see Table 5).

Table 5. Dates, times and positions of sampling stations and summary of activities during FOX 86-III¹. See Table 1 for abbreviations.

GMT ----- JD	Date	GMT	Sta. No.	FOX Sta. No.	Lat. N. (dd mm.m)	Long. W. (ddd mm.m)	Activities & Comments
PHASE I							
122	2 May	1034	1	19	58 39.4	152 39.5	CTD, N
		1130	2	20	58 41.3	152 44.1	CTD, B, b
		1258	3	21	58 42.6	152 50.4	CTD
		1441	4	22	58 45.3	152 56.0	CTD, N, B, b
		1542	5	23	58 47.3	153 01.9	CTD
		1636	6	24	58 49.3	153 07.4	CTD, B
		1758	7	25	58 50.7	153 13.0	CTD, N, B, b
123	3 May	0811	8	55	57 29.0	154 42.2	CTD, N, MZ, B, b
		0952	9	56	57 30.8	154 48.2	CTD, B
		1121	10	57	57 33.8	154 53.8	CTD, B
		1302	11	58	57 35.1	154 58.6	CTD, N, MZ, B, b
		1526	12	59	57 38.1	155 05.3	CTD, B
		1802	13	60	57 41.1	155 10.2	CTD, N, MZ, B
		1932	14	61	57 42.5	155 16.5	Deploy STD
		2154	15		57 36.1	155 21.3	CTD, N, MZ, B, b
124	4 May	0024	16		57 31.9	155 12.1	B
		0140	17		57 28.1	155 01.9	B
		0247	18		57 23.2	155 11.2	B
		0401	19		57 27.5	155 21.9	B
		0513	20		57 32.0	155 31.7	B
		0633	21		57 26.9	155 40.8	B
		0755	22		57 22.0	155 31.7	B
		0915	23		57 17.7	155 20.0	B
		1023	24		57 13.7	155 09.8	B
		1133	25		57 07.3	155 15.5	B
		1307	26		57 12.0	155 25.9	B
		1413	27		57 16.1	155 37.1	B
		1519	28		57 20.4	155 47.3	B
		1634	29		57 15.0	155 57.3	B
		1755	30		57 11.2	155 46.0	B
		1920	31		57 07.2	155 36.2	B
		2056	32		57 01.1	155 26.9	B
		2216	33		56 57.2	155 15.5	B
		2327	34		56 50.1	155 22.4	CTD, B
125	5 May	0129	35		56 54.4	155 32.4	CTD, B
		0316	36		56 58.9	155 42.7	CTD, B
		0711	37		57 04.3	155 53.4	CTD, B
		0853	38		57 08.3	156 02.7	CTD, B

¹Station times are determined by the CTD (at depth) or, in the absence of a CTD cast, by the first sampler in the water excluding the ADCP.

Table 5. Continued

GMT Date ----- JD	GMT	Sta. No.	FOX Sta. No.	Lat. N. (dd mm.m)	Long. W. (ddd mm.m)	Activities & Comments
126 6 May	1000	39		57 02.1	156 06.8	B
	1055	40		56 57.0	155 57.0	B
	1206	41		56 51.8	155 46.1	B
	1314	42		56 47.5	155 36.0	B
	1427	43		56 41.6	155 44.4	B
	1546	44		56 46.1	155 55.2	B
	1703	45		56 50.9	156 05.9	B
	1811	46		56 55.8	156 16.3	B
	1916	47		56 51.8	156 27.1	B
	2020	48		56 47.1	156 16.6	B
	2133	49		56 42.6	156 06.6	B
	2241	50		56 36.8	155 55.7	B, ADCP test
	0423	51		56 19.4	155 35.2	CTD, N, B
	0551	52		56 24.3	155 45.2	CTD
	0655	53		56 28.5	155 54.6	CTD
	0815	54		56 33.3	156 04.4	CTD, N, B
	1100	55		56 37.1	156 15.1	CTD, B
	1245	56		56 42.2	156 25.6	CTD, B
	1426	57		56 47.0	156 36.3	CTD, MZ, B

Depart from grid at sta. 57 for 1.5 h weather recording at Ugaiushak Island
1630-1800 GMT.

127 7 May	1948	58		56 36.2	156 57.2	B
	2100	59		56 31.4	156 46.4	B
	2202	60		56 26.9	156 36.5	B
	2315	61		56 22.5	156 25.8	B
	0133	62		56 17.2	156 50.5	B
	0243	63		56 12.6	156 04.2	B

PHASE II

0619	64		56 46.6	155 55.0	B (repeat of 44)
0738	65		56 51.1	156 05.6	B (repeat of 45)
0845	66		56 57.1	155 56.8	B (repeat of 40)
0957	67		57 02.8	155 48.9	B
1119	68		56 58.0	155 38.0	B
1225	69		56 52.5	155 45.9	B (repeat of 41)
1338	70		56 57.9	155 47.8	B

Table 5. Continued

GMT JD	Date	GMT	Sta. No.	FOX Sta. No.	Lat. N. (dd mm.m)	Long. W. (ddd mm.m)	Activities & Comments
		1446	71		56 52.0	155 45.2	B
		1557	72		56 47.5	155 45.2	B
		1709	73		56 53.5	155 36.9	B
		1904	74		57 02.5	155 58.0	B
		2003	75		57 01.9	156 07.0	B (repeat of 39)
		2057	76		56 57.0	156 06.9	B
PHASE III							
		2312	77		56 59.9	155 56.8	Test camera and MOCNESS (no samples); Deploy RTD
128	8 May	1546	78		56 59.2	155 58.1	ADCP, CTD, MOC
		2156	79		57 00.9	155 58.2	ADCP, CTD, MOC
129	9 May	0406	80		57 00.9	155 58.2	ADCP, CTD, MOC
		0935	81		57 03.0	155 56.3	ADCP, CTD, MZ, MOC
		1545	82		57 02.4	155 54.5	ADCP, CTD, Camera, Exp'l B
		1837	83		57 02.7	155 54.5	Exp. B
		2134	84		57 03.9	155 52.8	ADCP, CTD, Camera, Expt'l B
130	10 May	0226	85		57 04.3	155 48.4	Exp. B
		0357	86		57 03.7	155 48.5	CTD, Chloro, N, Phyto. Cell Counts, ADCP, Camera
		0710	87		57 03.1	155 46.2	Exp. B
		0832	88		57 02.7	155 43.7	Exp. B
		0931	89		57 03.5	155 46.0	CTD, ADCP, Camera, MZ, Exp. B
		1323	90		57 04.4	155 44.7	Exp. B
		1545	91		57 01.6	155 44.2	ADCP, CTD, MOC
		1829	92		56 59.6	155 41.8	Exp. B
		2141	93		56 59.8	155 41.3	ADCP, CTD, MOC, MZ
131	11 May	0152	94		56 37.5	155 36.9	Exp. B
		0411	95A		56 55.1	155 37.3	CTD, ADCP, MOC (nets 4-8)
		0644	95B		56 53.9	155 41.3	MOC (nets 1-3)
		0928	96		56 53.8	155 38.3	CTD, MZ, MOC
		1205	97		56 52.7	155 37.1	Exp. B
		2143	98		56 44.9	155 42.8	CTD, MZ

Table 5. Continued

GMT ----- JD	Date	GMT	Sta. No.	FOX Sta. No.	Lat. N. (dd mm.m)	Long. W. (ddd mm.m)	Activities & Comments
132	12 May	0407	99		56 42.9	155 45.0	CTD
		0940	100		56 40.1	155 49.5	CTD, MZ Recover RTD (actual position= 56°34.8'N, 155°47.6'W)
		1903	101		56 33.9	155 49.1	CTD, MZ Deploy STD (actual position= 56°34.1'N, 155°48.4'W)
		2115	102		56 29.9	155 31.9	CTD
		2219	103		56 32.3	155 39.9	CTD
133	13 May	0014	104		56 36.9	155 57.9	CTD
		0124	105		56 38.8	156 04.1	CTD
		0234	106		56 41.0	156 12.9	CTD
		0338	107		56 43.2	156 21.6	CTD
		0430	108		56 45.7	156 29.0	CTD
		0517	109		56 48.0	156 37.2	CTD, B

PHASE IV

		0517	109		(SEE ABOVE, 109 was last station on the above CTD transect and first on the new bongo grid).		
		0641	110		56 41.8	156 48.0	B
		0747	111		56 36.2	156 57.2	B (repeat of 58)
		0850	112		56 31.4	156 46.4	B (repeat of 59)
		0953	113		56 36.8	156 36.9	B
		1102	114		56 41.9	156 25.5	B (repeat of 56)
		1218	115		56 37.1	156 15.6	B (repeat of 55)
		1334	116		56 32.0	156 26.6	B
		1442	117		56 26.9	156 36.5	B (repeat of 60)
		1600	118		56 22.5	156 25.8	B (repeat of 61)
		1810	119		56 37.3	156 24.2	CTD, MOC
		2151	120		"	"	B, CTD, MOC
134	14 May	0600	121		"	"	B, CTD, MOC

Original station plan abandoned at this point to render assistance to vessel at Tugidak Island. One nighttime MOC and eight grid (bongo) stations were forfeited. Sampling was resumed on the FOX Chirikof-Semidi transect; the missed bongo stations were sampled later in the cruise.

Table 5. Continued

GMT JD	Date	GMT	Sta. No.	FOX Sta. No.	Lat. N. (dd mm.m)	Long. W. (ddd mm.m)	Activities & Comments
135	15 May	1153	122		55 56.8	156 23.0	MOC, CTD, N, B (CM 8508)
		1355	123		55 55.1	156 14.8	CTD
		1553	124		55 57.7	156 34.4	CTD
		1740	125A		55 56.9	156 23.6	CTD, MOC
136	16 May	0210	125B		55 56.6	156 23.5	CTD, ADCP, Camera
		0508	126		56 07.4	156 13.2	B
		0624	127		56 12.8	156 03.9	B (repeat of 63)
		0757	128		56 18.1	155 54.1	B
		0850	129		56 24.1	155 45.5	B (repeat of 52)
		0938	130		56 28.2	155 55.6	B (repeat of 53)
		1045	131		56 23.0	156 06.1	B
		1153	132		56 17.5	156 15.7	B (repeat of 62)
		1300	133		56 12.3	156 24.0	B
		1402	134		56 17.2	156 33.8	B
		1509	135		56 22.8	156 25.9	B (repeat of 61, 118)
		1619	136		56 27.9	156 15.9	B
		1731	137		56 32.6	156 05.0	B (repeat of 54)
		1845	138		56 37.1	156 15.0	B (repeat of 55, 115)
		2006	139		56 32.4	156 26.8	B (repeat of 116)
		2115	140		56 27.2	156 37.0	B (repeat of 60, 117)
		2212	141		56 22.3	156 45.2	B
		2307	142		56 21.1	156 52.9	ADCP, Camera
137	17 May	0446	143		56 26.5	157 01.5	ADCP, Camera
		0555	144		56 29.6	157 04.2	CTD
		0632	145		56 26.6	157 01.2	CTD, N
		0737	146		56 23.7	156 57.3	CTD, N
		0816	147		56 21.0	156 53.3	CTD, N, MZ, ADCP, MOC
		1007	148		56 18.4	156 50.2	CTD
		1052	149		56 16.1	156 48.2	CTD, N, B

Cross-channel bathymetry recorded on 38 KHz and annotated on/off station for 144-149.

1213	150	56 21.1	156 53.3	B
1308	151	56 26.6	157 01.1	B
1543	152A	56 26.8	157 01.0	ADCP, CTD, Camera
1816	152B	56 26.7	157 00.6	Camera
1921	152C	56 26.7	157 01.4	Camera
2032	153	56 24.4	156 57.6	ADCP, Camera
2130	154	56 20.9	156 53.2	CTD, ADCP, Camera

Table 5. Continued

GMT Date ----- JD	GMT	Sta. No.	FOX Sta. No.	Lat. N. (dd mm.m)	Long. W. (ddd mm.m)	Activities & Comments
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	2250	155		56 18.4	156 50.3	ADCP, Camera
	2340	156		56 15.9	156 47.8	CTD, ADCP, Camera

Circumnavigation of Aghiyuk Island (northernmost of Semidi Islands) and photo reconnaissance for possible location of FOX remote weather station.

138	18 May	0311	157		56 21.1	156 53.0	CTD, ADCP, MOC
		1016	158		57 20.9	156 00.0	CTD (CM 8510)
		1325	159	61	57 43.0	155 14.8	CTD, N, B, b (CM 8501; repeat of 14)
		1517	160	60	57 40.9	155 10.2	CTD, N, B, b (repeat of 13)
		1657	161	59	57 38.2	155 04.4	CTD (repeat of 12)
		1757	162	58	57 35.5	154 59.0	CTD, N, B, b (repeat of 11)
		1944	163	57	57 33.5	154 52.9	CTD (repeat of 10)
		2030	164	56	57 31.2	154 47.6	CTD (repeat of 9)
		2114	165	55	57 28.8	154 42.4	CTD, N, B, b (repeat of 8)
		2351	166	60	57 40.6	155 09.8	CTD, ADCP, MOC Deploy STD (repeat of 13, 160)

mooring #1 had a broken spindle at 245 m; #8 had a broken spindle and a bent rod at 106 m and a broken band attachment to the vane at 207 m; #11 had a broken rod at 186 m; and the 108 m current meter on mooring #13 was missing. The broken spindles most likely occurred during recovery. The current meters near 25 m depth on moorings 1 and 10 were badly fouled with marine organisms.

The ship's acoustic doppler current profiler was in operation throughout the cruise.

There were 179 CTDs conducted using the PMEL Sea Bird CTD system. A 25-hour time series of CTDs was conducted at mooring 8 following deployment. If each individual cast of the time series is counted (multiple casts per CTD file), there were 179 CTDs. However, there are only 136 CTD files. Four of the CTDs were conducted at BPR-mooring sites (Bottom Pressure Recorders deployed in the Shumagin Gap in coordination with the TSUNAMI research program at PMEL).

Bongo net tows were completed at seven stations. A net with mesh size 333 μ m was used on a 60-cm bongo net frame. Two of the seven stations also included a 20-cm bongo tow (150- μ m mesh). Precise monitoring of tow rates was impossible due to the lack of a wire-speed indicator; speeds were estimated from the wire-out indicator and a watch. Water samples for nutrient analyses were collected at 15 CTD stations.

The *Oceanographer* was stationed approximately 3.5 km east-northeast of Ugaiushak Island for 1.5 hours to collect wind, temperature, and pressure information every 10 minutes for comparison with data collected at the meteorological tower on the island. Station locations are illustrated in Fig. 6 and operations are summarized in Table 6. Current meter locations, dates, depths and configurations are given in Table 7.

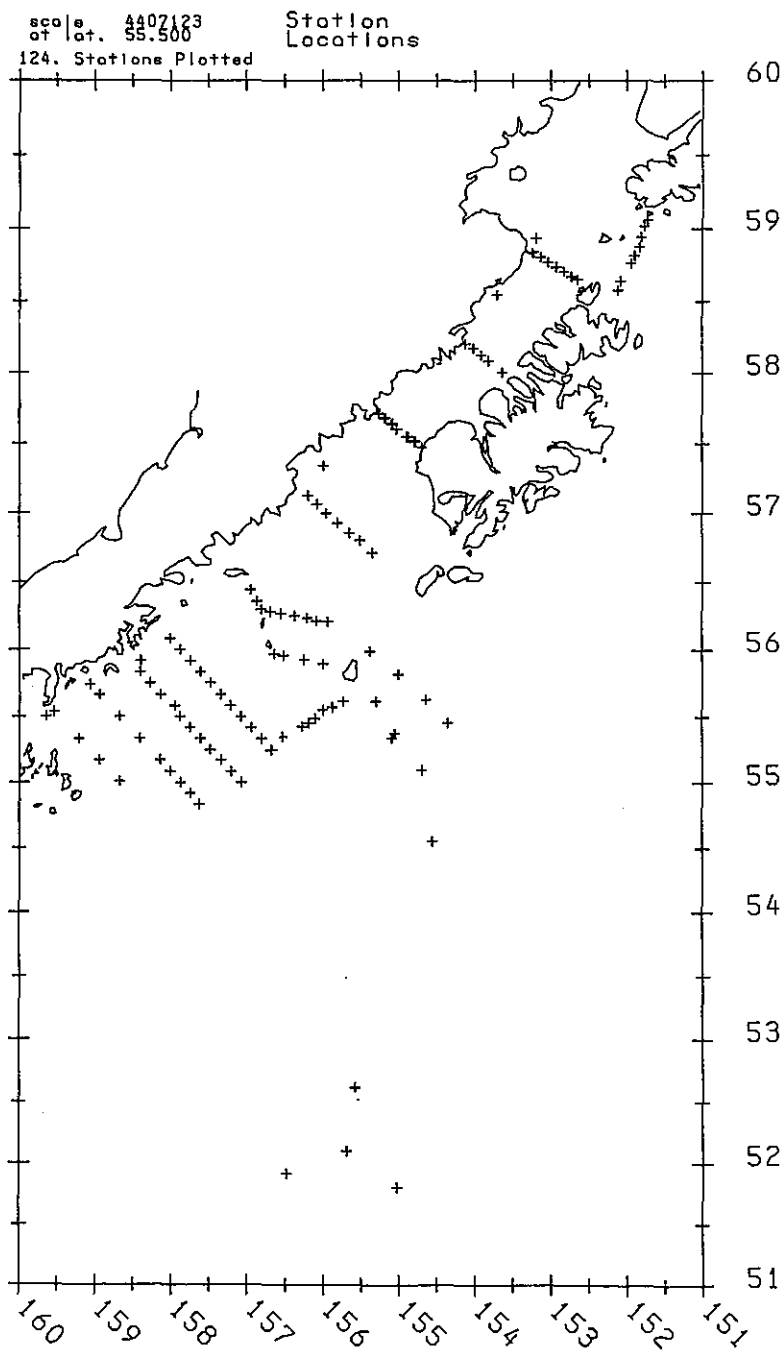


Fig. 6.--Station locations, FOX 86-IV.

Table 6. Dates, times and positions of sampling stations and summary of activities during FOX 86-IV. See Table 1 for abbreviations.

GMT ----- JD	Date	GMT	Sta. No.	FOX Sta. No.	Lat. N. (dd mm.m)	Long. W. (ddd mm.m)	Activities & Comments
210	29 Jul	1744	1	267	54.84	154.34	CTD
		1924	2	268	54.55	154.55	CTD
		2148	3	269	55.10	154.70	CTD
213	01 Aug	0646	4	M14 ¹	55.37	155.05	CTD
		1040	5	M13	55.62	155.30	CTD, N, B
		1324	6	177	55.61	155.74	CTD
		1415	7	178	55.57	155.87	CTD
		1522	8	M11	55.55	155.99	CTD
		1603	9	179	55.51	156.01	CTD
		1653	10	180	55.48	156.10	CTD
		1738	11	181	55.45	156.18	CTD
		1819	12	182	55.42	156.27	CTD
		1901	13	183	55.40	156.34	CTD
		2004	14	184	55.35	156.53	CTD
		2100	15	185	55.24	156.68	CTD
		2355		M11	55.40	156.34	Recover CM mooring
214	02 Aug	0220		M12	55.54	156.00	Recover CM mooring
		0525		M8	55.95	156.38	Recover CM mooring
		0607	16	158	55.97	156.63	CTD
		0700	17	157	55.96	156.52	CTD
		0755	18	156	55.94	156.43	CTD, N, B
		0938	19	155	55.94	156.35	CTD
		1034	20	154	55.92	156.25	CTD, N, B
		1217	21	153	55.91	156.18	CTD
		1332	22	152	55.89	156.00	CTD
		1856		M8	55.95	156.39	Deploy CM mooring
215	03 Aug	0017		M5	56.35	156.87	Recover CM mooring
		0310		M5	56.36	156.91	Deploy CM mooring
		0346	24	150	56.44	156.95	CTD, N, B
		0527	25	149	56.40	156.92	CTD
		0607	26	M5	56.36	156.91	CTD
		0640	27	148	56.36	156.87	CTD, N, B
		0822	28	147	56.30	156.80	CTD
		0915	29	146	56.28	156.68	CTD
		1004	30	145	56.27	156.55	CTD
		1106	31	144	56.25	156.37	CTD
		1221	32	143	56.24	156.20	CTD
		1321	33	142	56.21	156.08	CTD
		1419	34	141	56.21	155.93	CTD

¹"M" refers to mooring location

Table 6. Continued

GMT ----- JD	Date	GMT	Sta. No.	FOX Sta. No.	Lat. N. (dd mm.m)	Long. W. (ddd mm.m)	Activities & Comments
216	04 Aug	0302		M14	55.36	155.08	Deploy CM Mooring
		0510	35	128	55.45	154.35	CTD, N
		0851	36	129	55.63	154.65	CTD, N
		1201	37	130	55.82	155.01	CTD, N
		1422	38	131	55.99	155.38	CTD
		1744		M13	55.61	155.32	Recover CM Mooring
		1915	39	M14	55.34	155.09	CTD
		2230		M14	55.37	155.08	Recover CM Mooring
217	05 Aug	1201	40	M10	57.34	155.99	CTD
		1655		M10	57.35	155.98	Recover CM Mooring
		1926	41	M1	57.71	155.26	CTD
		2140		M1	57.72	155.26	Recover CM Mooring
218	06 Aug	0018		M2	57.61	155.07	Deploy CM Mooring
		0108	42	61	57.71	155.26	CTD
		0150	43	60	57.68	155.18	CTD
		0246	44	59	57.64	155.09	CTD
		0331	45	58	57.60	155.02	CTD
		0437	46	57	57.55	154.87	CTD
		0537	47	56	57.52	154.78	CTD
		0631	48	55	57.47	154.70	CTD
		0829			57.77	154.69	Deploy 2 STD
		1141	49	34	58.00	153.63	CTD
		1212	50	35	58.55	153.71	CTD
		1309	51	36	58.08	153.82	CTD
		1351	52	37	58.13	153.92	CTD
		1431	53	38	58.17	154.02	CTD
		1519	54	39	58.21	154.12	CTD
		1942	55	25	58.85	153.22	CTD
		2021	56	24	58.81	153.13	CTD
		2104	57	23	58.77	153.03	CTD
		2150	58	22	58.74	152.93	CTD
		2234	59	21	58.71	155.82	CTD
		2310	60	20	58.68	152.73	CTD
		2345	61	19	58.66	152.65	CTD
219	07 Aug	0249	62	9	59.06	151.72	CTD
		0349	63	8	59.02	151.76	CTD
		0428	64	7	58.94	151.80	CTD
		0510	65	6	58.88	151.83	CTD
		0541	66	5	58.82	151.89	CTD
		0615	67	4	58.76	151.94	CTD
		0743	69	2	58.64	152.08	CTD
		0826	70	1	58.58	152.12	CTD

Table 6. Continued

GMT ----- JD	Date	GMT	Sta. No.	FOX Sta. No.	Lat. N. (dd mm.m)	Long. W. (ddd mm.m)	Activities & Comments
220	08 Aug	0540	71	20	58.67	152.72	CTD, N
		0645	72	22	58.74	152.92	CTD, N
		0836	73	25	58.93	153.18	CTD, N
		1657	74	61	57.72	155.26	CTD, N
		1854	75	60	57.68	155.16	CTD, N
		2200	76	59	57.64	155.07	CTD
		2306	77	M2	57.61	155.07	CTD
		2350	78	58	57.61	155.01	CTD, N, B, b
221	09 Aug	0226	79	57	57.55	154.89	CTD
		0328	80	56	57.51	154.79	CTD, N, B, b
		0950	81	99	56.71	155.35	CTD
		1111	82	100	56.81	155.51	CTD
		1232	83	101	56.85	155.65	CTD
		1347	84	102	56.92	155.80	CTD
		1427	85	103	56.99	155.95	CTD
		1602	86	104	57.06	156.09	CTD
		1703	87	105	57.13	156.20	CTD
		2000-2130			57.80	156.79	Ugaiushak Is. wind time series CTD time series
222-3		0328- 0409	88-95 ²	M8	55.95	156.38	CTD time series
223	11 Aug	0740	96	185	55.25	156.67	CTD
		0825	97	186	55.34	156.80	CTD
		0932	98	187	55.42	156.93	CTD
		1024	99	188	55.50	157.07	CTD
		1142	100	189	55.58	157.20	CTD

²24-hour CTD time-series casts at Mooring 8, as follows:

CTD Cast No.	Number of Casts
88	8
89	8
90	6
91	10
92	6
93	3
94	8
95	2

The cast number was changed only when the CTD was brought on deck.

Table 6. Continued

GMT ----- JD	Date	GMT	Sta. No.	FOX Sta. No.	Lat. N. (dd mm.m)	Long. W. (ddd mm.m)	Activities & Comments
		1245	101	190	55.67	157.34	CTD
		1335	102	191	55.76	157.48	CTD
		1431	103	192	55.83	157.60	CTD
		1527	104	193	55.92	157.74	CTD
		1616	105	194	56.00	157.87	CTD
		1711	106	195	56.08	158.00	CTD
		1903	107	219	55.92	158.39	CTD
		2013	108	218	55.83	158.40	CTD
		2112	109	217	55.75	158.27	CTD
		2203	110	216	55.67	158.13	CTD
		2300	111	215	55.58	157.93	CTD
		2356	112	214	55.50	157.87	CTD
224	12 Aug	0046	113	213	55.42	157.74	CTD
		0151	114	212	55.33	157.60	CTD
		0239	115	211	55.25	157.48	CTD
		0328	116	210	55.17	157.33	CTD
		0428	117	209	55.08	157.20	CTD
		0522	118	208	55.00	157.07	CTD
		0742	119	231	54.83	157.61	CTD
		0848	120	232	54.92	157.74	CTD
		0943	121	233	55.00	157.87	CTD
		1038	122	234	55.09	158.00	CTD
		1137	123	235	55.17	158.13	CTD
		1255	124	237	55.33	158.40	CTD
		1434	125	239	55.50	158.66	CTD
		1615	126	241	55.67	158.94	CTD
		1749	127	242	55.74	159.06	CTD
		1949	128	266	55.53	159.53	CTD
		2022	129	265	55.50	159.64	CTD
		2156	130	263	55.33	159.21	CTD
		2329	131	261	55.17	158.94	CTD
225	13 Aug	0107	132	259	55.01	158.67	CTD
		1628		BPR2	52.10	155.70	Deploy BPR #2
		1633	133	BPR2	52.10	155.69	CTD
		2355		BPR1	52.61	155.58	Deploy BPR #1
		2356	134	BPR2	52.61	155.58	CTD
226	14 Aug	1548		BPR3	51.79	155.04	Deploy BPR #3
		1549	135	BPR3	51.81	155.03	CTD
227	15 Aug	0259		BPR4	51.91	156.49	Deploy BPR #4
		0300	136	BPR4	51.92	156.49	CTD

5.0. MOORED INSTRUMENT SUMMARY

Table 7 summarizes locations and other information for current meter mooring recoveries and deployments.

6.0 REMOTE WEATHER STATION SUMMARY

Table 8 summarizes locations and other information for the five METNET stations deployed during 1986. The Ugaiushak Island station replaced one previously in service at the same location. This prior station reported data throughout FY 1986.

7.0 DRIFTER SUMMARY

Radar-tracked drifters were deployed during two FOX cruises for periods of 1 to 4 d and were followed for sampling of pollock eggs (FOX 86-II) and larvae (FOX 86-III). Drogue depths were nominally 200 and 40 m, respectively. Position fixes were made sporadically during FOX 86-II and hourly during FOX 86-III.

Satellite-tracked drifters were deployed during RIBS and FOX cruises and by U.S. Coast Guard helicopter in the FOX study area. Table 9 lists the date, position, drogue depth, deployment method (cruise/ship/helicopter) and platform identification number (ARGOS No.) for each deployment.

8.0 SATELLITE IMAGE SUMMARY

Tables 10A, B (Advanced Very High Resolution Radiometer), and C (Coastal Zone Color Scanner) list the satellite data (hard copy and digital tape) archived at PMEL for FOCI. FY 86 was the first year in which satellite data was being archived, therefore the historical data collected during the year are also included.

Table 7. Current meter mooring locations, instrument depths and dates of retrieval/deployment.

Array No.	Deploy		Recover		Lat. N.	Long. W.	Meter	Depth
	JD	Date	JD	Date	(dd mm.mm)	(ddd mm.mm)	Type	(m)
8501	294	21OCT85	217	05AUG86	57 42.97	155 15.69	NB ¹	25.5
							AA	26.0
							AA	26.5
							AA	56.0
							AA	106.0
							AA	165.0
							AA	245.0
							PG	257.0
8505	284	11OCT85	214	02AUG86	56 20.98	156 53.24	AA	26.0
							AA	27.0
							AA	56.0
							AA	110.0
							PG	126.0
8508	284	11OCT85	214	02AUG86	55 56.78	156 23.00	NB	25.0
							AA	26.0
							AA	27.25
							AA	56.0
							AA	106.0
							AA	165.0
							AA	207.0
8510	293	20OCT85	217	05AUG86	57 20.89	155 59.65	PG	221.0
							NB	25.0
							S-4	25.5
							AA	26.0
							AA	27.5
							AA	56.0
							AA	85.0
							PG	98.0
8511	284	11OCT85	214	02AUG86	55 32.61	155 59.50	PG	100.0
							(on anchor)	
							NB	25.0
							AA	26.0
							AA	27.25
							AA	56.0

¹AA = Aanderaa

NB = Neil Brown

PG = pressure gauge (3 m above bottom except as noted "on anchor")

S-4 = InterOcean electromagnetic meter

Table 7. Continued

Array No.	Deploy		Recover		Lat. N. (dd mm.mm)	Long. W. (ddd mm.mm)	Meter Type	Depth (m)
	JD	Date	JD	Date				
8512	284	11OCT85	214	02AUG86	55 24.34	156 19.99	AA	106.0
							AA	165.0
							AA	186.0
							PG	199.0
							NB	25.0
							AA	26.0
							AA	27.25
							AA	56.0
							AA	106.0
							AA	172.0
8513	287	14OCT85	216	04AUG86	55 36.75	155 18.72	PG	188.0
							NB	106.0
							AA	107.0
							AA	108.25
							AA	165.0
							AA	200.0
							AA	500.0
8514	287	14OCT85	216	04AUG86	55 22.13	155 03.75	PG	643.0
							NB	105.0
							AA	106.0
							AA	107.25
							AA	165.0
							AA	200.0
							AA	500.0
8602	218	06AUG86			57 36.57	155 04.06	AA	1000.0
							AA	1187.0
							AA	60.0
							AA	85.0
							AA	135.0
							AA	193.0
							AA	245.0
8605	215	03AUG86			56 21.50	156 54.30	PG	259.0
							(on anchor)	
							AA	30.0
							AA	56.0
							AA	106.0
8605	215	03AUG86			56 21.50	156 54.30	PG	126.0
							(on anchor)	

Table 7. Continued

Array No.	Deploy		Recover		Lat. N.	Long. W.	Meter	Depth
	JD	Date	JD	Date	(dd mm.mm)	(ddd mm.mm)	Type	(m)
8608	214	02AUG86			55 56.89	156 23.18	AA	30.0
							AA	56.0
							AA	106.0
							AA	165.0
							AA	207.0
							PG	225.0
							(on anchor)	
8614	216	04AUG86			55 21.36	155 04.45	AA	133.0
							AA	632.0
							AA	1132.0
							PG	1322.0
							(on anchor)	

Table 8. Names, locations, elevations above sea level, and deployment dates and times of remote weather stations operating during FY 86. Stations installed during September 1986 comprise FOCI's METNET.

Station Name	Lat. N (dd mm.m)	Long. W (ddd mm.m)	Elevation (m)	Deployment	
				Date	Time (GMT)
¹ Cherni Is.	54 37.8	162 22.8	29.0	10/01/85	0000
¹ Ugaiushak Is.	56 47.6	156 51.1	33.6	04/14/86	2200
Wide Bay	57 25.0	156 10.9	20.0	09/09/86	2300
Chirikof Is.	55 54.6	155 34.1	57.1	09/11/86	2000
Tugidak Is.	56 25.6	154 42.6	63.8	09/11/86	2000
Ugaiushak Is.	56 47.6	156 51.1	33.6	09/12/86	2000
Chowiet Is.	56 03.9	156 41.8	104.5	09/12/86	2300

¹pre-METNET platforms, see Section 3.3

Table 9. Deployment records for satellite-tracked drifters

Date JD ¹	Time ¹	Initial Position ¹ Lat.(°N)	Long.(°W)	Drogue Depth (m)	Deployment Method ³	Platform ID
I. SHELIKOF STRAIT						
105	1935	57.695	155.240	230	H	5610
123	1950	57.685	155.181	45	MF (FOX 86-III)	7160
132	1934	56.552	155.800	40	MF (FOX 86-III)	7163
132	2253	57.681	155.122	45	H	7164
139	0258	57.664	155.192	45	MF (FOX 86-III)	7161
140	0236	57.568	155.231	45	H	7165
164	2003	57.639	155.138	45	H	7162
218	0829	57.768 ²	154.690	45	OC (FOX 86-IV)	5611
218	0829	57.768 ²	154.690	45	OC (FOX 86-IV)	5612
II. BERING SEA						
049	2230	55.588 ²	177.711	45	MF (RIBS 86-I)	2326
054	1322	53.650 ²	170.725	45	MF (RIBS 86-I)	2325
054	1413	53.748 ²	170.816	45	MF (RIBS 86-I)	2329
054	2248	54.108 ²	171.193	45	MF (RIBS 86-I)	2328
058	0635	54.197 ²	167.015	45	MF (RIBS 86-I)	2327
058	0950	54.137 ²	166.903	45	MF (RIBS 86-I)	2324

¹Initial positions, dates, and times are from ARGOS except as noted by ².

²Initial position and time from MOA (Marine Observation Abstract, vessel) at time of deployment.

³MF = *Miller Freeman*

H = U.S. Coast Guard Helicopter

OC = *Oceanographer*

Table 10A. AVHRR Satellite Data Hard Copy Images and Tapes from NOAA/NESDIS.

Date	Julian Day	Time	Satellite	Orbit No.	Equator Crossing	Frame No.
09 APR 79	099	00:35:27	TN	02504		1
10	100	00:25:13	TN	02518		
11	101	00:00:00	TN	02532		
12	102	00:03:56	TN	02546		
12	102	23:52:47	TN	02560		
13	103	23:42:17	TN	02574		
14	104	01:23:39	TN	02575		
14	104	23:32:51	TN	02588		
15	105	01:12:59	TN	02589		
15	105	15:07:01	TN	02597		
15	105	23:21:09	TN	02602		
15	105	23:25:10	TN	02602		
16	106	01:02:42	TN	02603		
19	109	00:31:32	TN	02645		
26	116	00:58:35	TN	02744		
07 MAY	127	00:43:59	TN	02899		
08	128	00:33:33	TN	02913		
11	131	00:01:26	TN	02955		
27	147	00:35:01	TN	03181		
11 APR 80	102	18:40:25	6	04110	011 E	2
11	102	18:44:26	6	04110	011 E	3
08 MAY	129	18:53:33	6	04494	020 E	3
21 MAR 81	080	04:33:53	6	08994	129 W	1
24 MAY	144	19:19:10	6	09913	014 E	3
01 APR 82	091	13:40:59	7	03982	024 E	1
01	091	23:31:59	7	03988	128 W	1
02	092	13:28:58	7	03996	027 E	3
02	092	23:19:57	7	04002	125 W	1
03	093	01:01:16	7	04003	150 W	1
03	093	13:13:14	7	04010	030 E	2
03	093	13:17:15	7	04010	030 E	3
04	094	13:01:14	7	04024	033 E	2
13	103	00:44:23	7	04144	146 W	1
13	103	12:55:25	7	04151	053 E	2
14	104	00:31:27	7	04158	143 W	1
22	112	00:37:21	7	04271	144 W	1
02 MAY	122	14:12:03	7	04420	016 E	2
02	122	14:16:04	7	04420	016 E	3
03	123	00:07:27	7	04426	136 W	1
03	123	14:04:02	7	04434	019 E	3
03	123	23:56:00	7	04440	133 W	1
06	126	23:19:41	7	04482	124 W	1
15	135	01:06:13	7	04596	151 W	1

Table 10A. Continued

Date	Julian Day	Time	Satellite	Orbit No.	Equator Crossing	Frame No.
16 MAY	136	00:54:06	7	04610	148 W	1
20	140	00:06:50	7	04666	136 W	1
25	145	00:47:37	7	04737	147 W	1
31	151	23:23:48	7	04835	125 W	1
01 APR 83	091	00:32:25	7	09128	138 W	1
14	104	01:15:17	7	09312	148 W	1
19	109	01:15:05	7	09382	133 W	1
19	109	14:11:13	7	09390	022 E	3
26	116	00:30:32	7	09481	137 W	1
27	117	00:18:15	7	09495	134 W	1
27	117	14:10:32	7	09503	021 E	2
27	117	14:14:33	7	09503	021 E	3
30	120	01:22:08	7	09538	150 W	1
30	120	13:34:02	7	09545	031 E	2
30	120	13:38:03	7	09545	031 E	3
30	120	15:18:53	7	09546	005 E	3
30	120	23:28:37	7	09551	121 W	1
01 MAY	121	01:09:51	7	09552	147 W	1
08	128	01:25:32	7	09651	151 W	1
08	128	13:37:22	7	09658	030 E	2
08	128	13:41:23	7	09658	030 E	3
08	128	23:32:01	7	09664	122 W	1
13	133	00:24:54	7	09721	135 W	1
20	140	00:40:09	7	09820	139 W	1
25	145	01:19:47	7	09891	149 W	1
28	148	00:43:19	7	09933	140 W	1
03 APR 84	094	01:02:46	7	14325	139 W	1
03	094	18:57:34	8	05290	017 E	2
04	095	00:50:51	7	14339	136 W	1
04	095	04:48:37	8	05296	134 W	1
10	101	15:09:53	7	14432	013 E	2
10	101	15:13:54	7	14432	013 E	3
17	108	13:43:11	7	14530	035 E	2
17	108	15:24:03	7	14531	009 E	2
17	108	15:28:04	7	14531	009 E	3
18	109	01:19:15	7	14537	143 W	1
18	109	04:46:53	8	05495	133 W	1
18	109	15:11:52	7	14545	012 E	2
18	109	15:15:53	7	14545	012 E	3
19	110	01:07:07	7	14551	139 W	1
19	110	04:24:28	8	05509	128 W	1
19	110	14:59:32	7	14559	016 E	2
19	110	15:03:33	7	14559	016 E	3
20	111	00:55:15	7	14565	136 W	1

Table 10A. Continued

Date	Julian Day	Time	Satellite	Orbit No.	Equator Crossing	Frame No.
24 APR	115	13:57:59	7	14629	031 E	2
24	115	14:02:00	7	14629	031 E	3
24	115	15:38:57	7	14630	006 E	2
24	115	15:42:58	7	14630	006 E	3
24	115	18:03:36	8	05588	031 E	2
24	115	18:07:37	8	05588	031 E	3
25	116	01:33:28	7	14636	146 W	1
04 MAY	125	01:24:08	7	14763	143 W	1
05	126	01:11:49	7	14777	140 W	1
09	130	00:24:44	7	14833	128 W	2
09	130	02:03:11	7	14834	153 W	1
09	130	19:20:10	8	05802	012 E	2
09	130	19:24:11	8	05802	012 E	3
10	131	00:08:44	7	14847	124 W	1
10	131	00:12:45	7	14847	124 W	2
10	131	01:50:39	7	14848	150 W	1
10	131	14:02:20	7	14855	031 E	2
10	131	14:06:21	7	14855	031 E	3
11	132	01:38:22	7	14862	147 W	1
12	133	01:25:28	7	14876	144 W	1
12	133	18:16:26	8	05844	028 E	2
13	134	01:21:08	7	14890	140 W	1
13	134	05:46:27	8	05851	148 W	1
20	141	01:27:40	7	14989	144 W	1
28	149	01:30:02	7	15102	144 W	1
31	152	00:53:46	7	15144	135 W	1
24 MAR 85	083	05:05:50	6	29835	147 W	1
27	086	13:49:33	9	01483	015 E	2
27	086	13:53:34	9	01483	015 E	3
31	090	03:57:58	6	29934	130 W	1
31	090	23:02:22	9	01545	126 W	1
01 APR	091	03:33:21	6	29948	124 W	1
01	091	22:51:16	9	01559	123 W	1
02	092	00:33:12	9	01560	149 W	1
02	092	04:50:15	6	29963	143 W	1
04	094	17:47:24	6	29999	026 E	2
05	095	00:00:55	9	01602	141 W	1
08	098	04:06:05	6	30048	132 W	1
08	098	13:22:26	9	01652	022 E	2
08	098	13:26:27	9	01652	022 E	3
08	098	23:18:43	9	01658	130 W	1
09	099	03:41:37	6	30062	126 W	1
09	099	23:07:11	9	01672	127 W	1
10	100	00:48:47	9	01673	153 W	1
12	102	00:27:38	9	01701	147 W	1
13	103	14:09:51	9	01723	010 E	2

Table 10A. Continued

Date	Julian Day	Time	Satellite	Orbit No.	Equator Crossing	Frame No.
15 APR	105	23:44:55	9	01757	136 W	1
18	108	23:11:49	9	01799	128 W	1
19	109	04:42:08	6	30205	141 W	1
19	109	13:05:59	9	01807	027 E	2
24	114	04:21:54	6	30276	136 W	1
27	117	23:17:17	9	01926	129 W	1
28	118	18:11:43	6	30341	019 E	2
28	118	23:06:05	9	01940	127 W	1
29	119	00:47:42	9	01941	152 W	1
02 MAY	122	00:15:26	9	01983	144 W	1
04	124	23:43:33	9	02025	136 W	1
12	132	00:10:15	9	02124	142 W	1
15	135	13:30:50	9	02174	021 E	2
15	135	13:34:51	9	02174	021 E	3
15	135	23:27:04	9	02180	131 W	1
16	136	13:20:29	9	02188	023 E	2
16	136	23:15:47	9	02194	129 W	1
19	139	12:48:23	9	02230	031 E	2
19	139	14:29:35	9	02231	006 E	2
20	140	00:25:14	9	02237	146 W	1
20	140	14:18:33	9	02245	009 E	2
20	140	14:22:34	9	02245	009 E	3
21	141	00:14:44	9	02251	143 W	1
22	142	13:57:05	9	02273	014 E	2
22	142	23:53:45	9	02279	138 W	2
23	143	13:46:26	9	02287	017 E	2
23	143	13:50:27	9	02287	017 E	3
23	143	23:43:04	9	02293	135 W	1
03 APR 86	093	14:46:19	9	06731	006 E	2
04	094	00:42:26	9	06737	146 W	1
06	096	00:20:36	9	06765	141 W	1
06	096	14:13:42	9	06773	014 E	2
07	097	00:10:29	9	06779	138 W	1
07	097	23:59:25	9	06793	135 W	1
08	098	13:52:18	9	06801	020 E	2
08	098	13:56:19	9	06801	020 E	3
08	098	23:48:38	9	06807	133 W	1
15	105	00:25:09	9	06892	142 W	1
15	105	14:18:13	9	06900	013 E	2
24	114	14:22:22	9	07027	012 E	2
25	115	14:11:41	9	07041	015 E	2
26	116	14:01:01	9	07055	018 E	2
26	116	14:05:02	9	07055	018 E	3
26	116	23:57:17	9	07061	134 W	1
27	117	13:50:08	9	07069	020 E	2

Table 10A. Continued

Date	Julian Day	Time	Satellite	Orbit No.	Equator Crossing	Frame No.
27 APR	117	13:54:09	9	07069	020 E	3
27	117	23:46:25	9	07075	132 W	1
28	118	13:39:17	9	07083	023 E	2
28	118	13:43:18	9	07083	023 E	3
28	118	23:35:29	9	07089	129 W	1
29	119	13:28:49	9	07097	026 E	2
29	119	13:32:50	9	07097	026 E	3
29	119	23:24:27	9	07103	126 W	1
30	120	01:05:36	9	07104	152 W	1
30	120	13:17:49	9	07111	029 E	2
30	120	13:21:50	9	07111	029 E	3
01 MAY	121	00:54:22	9	07118	149 W	1
02	122	00:43:40	9	07132	146 W	1
05	125	00:11:54	9	07174	138 W	1
13	133	00:26:55	9	07287	142 W	1
13	133	14:20:05	9	07295	013 E	2
13	133	14:24:06	9	07295	013 E	3
16	136	23:44:04	9	07343	131 W	1
18	138	01:14:16	9	07358	154 W	1
20	140	00:52:14	9	07389	148 W	1
22	142	00:30:54	9	07414	143 W	1
24	144	00:09:47	9	07442	137 W	1
24	144	23:59:26	9	07456	134 W	1
26	146	23:37:25	9	07484	129 W	1
27	147	01:18:36	9	07485	154 W	1
28	148	01:07:39	9	07499	152 W	1
29	149	00:57:08	9	07513	149 W	1

Total: 210 images

Table 10B. AVHRR Satellite Data Tapes from Gilmore Creek, Alaska.

Date	Satellite No.	Orbit No.
15 FEB 86	9	6060
	6	34505
	9	6067
	9	6068
	6	34513
	9	6073
16 FEB 86	9	6074
	6	34519
	6	34520
	9	6081
	9	6082
	6	34527
17 FEB 86	6	34528
	9	6088
	6	34534
	9	6096
	6	34542
	9	6102
18 FEB 86	6	34548
	9	6110
	6	34556
	9	6144
	9	6257
	6	34704
1 MAR 86	6	34705
	9	6265
	6	34713
	9	6271
	6	34719
	9	6279
2 MAR 86	6	34727
	9	6285
	6	34733
	9	6300
	6	34804
	6	34812
9 MAR 86	9	6370
	6	34818
	6	34819
	9	6378
	6	34826
	9	6454
14 MAR 86	9	6455
15 MAR 86	9	6511
19 MAR 86	9	6511
	6	34961
	9	6519

Table 10B. Continued

Date	Satellite No.	Orbit No.
	6	34969
	9	6525
20 MAR 86	6	34975
	9	6533
22 MAR 86	9	6554
29 MAR 86	9	6652
	6	35013
30 MAR 86	9	6680
4 APR 86	9	6737
6 APR 86	9	6765
	6	35217
	9	6773
	6	35225
7 APR 86	9	6779
	6	35231
	6	35232
	9	6787
	6	35239
	6	35240
	9	6793
8 APR 86	6	35246
	9	6801
	6	35254
	9	6807
16 APR 86	9	6906
	6	35360
	9	6914
	6	35368
17 APR 86	9	6920
	6	35374
	9	6928
	6	35382
	9	6934
21 APR 86	9	7005
	6	35459
	9	7013
	6	35467
24 APR 86	9	7019
26 APR 86	9	7047
	6	35502
	9	7055
	6	35510
	9	7061
27 APR 86	6	35516
	9	7069
28 APR 86	9	7075

Table 10B. Continued

Date	Satellite No.	Orbit No.
30 APR 86	6	35559
	9	7111
	6	35567
	9	7117
1 MAY 86	6	35573
	9	7125
	6	35581
2 MAY 86	9	7132
	6	35587
	9	7281
12 MAY 86	6	35738
	9	7287
13 MAY 86	6	35744
	9	7295
	9	7386
	6	35844
20 MAY 86	9	7393
	9	7394
	6	35852
	9	7399
	9	7400
	6	35858
	9	7407
21 MAY 86	9	7408
	6	35866
	9	7414
	6	35872
	9	7422
22 MAY 86	6	35909
	9	7456
	6	35915
	9	7464
	6	35923
24 MAY 86	9	7499
	6	35958
	9	7506
	6	35966
	9	7512
28 MAY 86	9	7513
	6	35972
	9	7520
	9	7521
29 MAY 86		

Total: 134 images

Table 10C. CZCS Satellite Data Tapes.

Date	Orbit No.
15 APR 79	2400 (two 2 min scenes)
11 APR 80	7402 (two 2 min scenes)
21 MAR 81	12156
30 APR 83	22799
08 MAY	22910
17 APR 84	27679
18 APR	27693
30 MAR 85	32476
08 APR	32600

Total: 10 images

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